Collins, B.J.

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Applying Economic Evaluation to Public Health: Case Studies in Cost Effectiveness

Thesis submitted in accordance with the requirements of the

University of Liverpool for the degree of Doctor in Philosophy

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Brendan Joseph Collins

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Supervisors: Dr Alan Haycox

Dr Mike Rowe

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Abstract

For local public health teams, commissioning services that work and are cost effective is important. Having ways of evaluating and assessing their cost effectiveness is invaluable. Health economics and public health have a natural kinship as they both take a population approach to maximising health. The aim of this investigation is to give examples of how a mixed methods approach can be used. This thesis gives three case studies where public health commissioned services for alcohol, tobacco and drug addiction in the North West of England have been evaluated for their cost effectiveness using a mix of economic evaluation techniques combined with elements of realist evaluation and equity impact analysis. These mixed methods evaluation techniques involve engaging with stakeholders to develop a common understanding of outcomes and assumptions in reaching a common understanding of the causal mechanisms that make an intervention work. This thesis outlines how the results of these evaluations were useful in informing strategy and the commissioning process and how they may be used more in the future. There were some novel analyses including matching up crime data and putting a cost on these crimes for people in contact with a drugs test on arrest programme, which found that costs were lower after the drug intervention. The researcher found that there was not a significant change in admissions post-detoxification which indicates that perhaps inpatient residential detoxification has only a limited effect on long term health prospects. This thesis has shown that economic evaluation and realist evaluation methods pose some challenges but can be carried out at a local level as a way of looking at public health interventions through a more complex lens.

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I am grateful to everyone for their assistance. However, the work is my own and I am responsible for the content of this thesis.

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This thesis is partly the story of me. My mother's parents were both brain doctors (a psychiatrist and a neurologist) who lit my interest in the brain. I grew up in an area of deep deprivation which sparked my interest in health inequalities before I knew what health inequalities were. The first time I learned about psychology it explained so much to me, and the first time I learned about health economics it really chimed with my ideas about human behaviour and preferences. I think that health economics as a discipline has its limitations but is very explicit about it, and maybe apologises too much. More recently when I learned more about realist evaluation it really spoke to me as a way of accounting for complexity and thinking about the mechanism; previously for any evaluation my first question would be describe the mechanism; because to me this is the way of proving that you know how your service is achieving its outcomes.

This thesis is dedicated to my wife Sarah and my son Thomas.

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List of Acronyms

A&E - accident & emergency department (in hospital).

AA - alcoholics anonymous.

AAF - alcohol attributable fraction, a population level estimate of the proportion of a disease that is caused by alcohol use.

ADHD - attention deficit hyperactivity disorder.

APHO - Association of Public Health Observatories (now part of Public Health England).

ASH - action on smoking and health, a UK anti-tobacco research and lobbying group.

ASSIST - a stop smoking in schools trial, a smoking prevention intervention for young people in secondary schools.

AUDIT - alcohol use disorders identification questionnaire.

BBVs - blood borne viruses.

CBA – cost benefit analysis.

CBT - cognitive behavioural therapy.

CEA – cost effectiveness analysis.

CHD - coronary heart disease.

CMO - context-mechanism-outcome configuration, used in realist evaluations.

COM-B - theory of motivation, stands for capability, opportunity, motivation - behaviour.

COPD - chronic obstructive pulmonary disease.

CUA – cost utility analysis.

CV - curriculum vitae.

CVD - cardiovascular disease.

CWP – Cheshire & Wirral Partnership Trust.

DALY – disability adjusted life year, a measure of the burden of ill health in terms of years of life lost and years lived in disability compared to a benchmark (often Japan life expectancy).

DCEA - distributional cost effectiveness analysis.

DH - Department of Health (UK) sometimes called DoH.

DIP – Drug Interventions Programme – a programme of drug treatment and monitoring for people who have been arrested for 'trigger' offences.

DRR – Drug Rehabilitation Requirement – a requirement for an individual who has committed a crime to complete drug treatment as part of a community order. A failure to complete treatment will mean the person returns to court.

DTORS - Drug Treatment Outcomes Research Study, a major longitudinal outcomes study of drug treatment in England, published in 2009. See also NTORS.

EBM – Evidence Based Medicine.

EQ-5D or EQ-5D-3L– Euroqol 5 dimension (3 level) general health related quality of life questionnaire.

EQ-5D-5L - Euroqol 5 dimension (5 level) general health related quality of life questionnaire.

EU - European Union.

FY - financial year, in the UK runs from 1st April to 31st March.

GDP - gross domestic product.

GP - General Practitioner, primary healthcare giver in the UK.

HIV - human immunodeficiency virus.

HRU - harm reduction unit.

HSIS - health services in schools.

IBA – intervention & brief advice (Alcohol) (also called SBI – screening and brief intervention).

ICER - incremental cost effectiveness ratio, the incremental change in cost per incremental unit of benefit.

IHS - integrated household survey, a survey commissioned by ONS on lifestyle behaviours.

IOM - integrated offender management.

IPED - image and performance enhancing drugs i.e. steroids, etc.

IT - information technology.

JSNA - Joint Strategic Needs Assessment, a local authority level assessment of health and social care needs of the population.

LDQ - Leeds Dependency Questionnaire.

LJMU - Liverpool John Moores University.

LSD - Lysergic acid diethylamide, a psychedelic drug commonly known as 'acid'.

LSOA – lower layer super output area – a small area of geography used by the UK Office for National Statistics since the 2001 Census, with an average population of around 1,500 persons.

MARAC - Multi Agency Risk Assessment Conferences (MARAC).

MCDA - multi criteria decision analysis.

MDMA - 3,4-methylenedioxy-N-methylamphetamine - an illegal drug otherwise known as ecstasy.

MI - myocardial infarction (heart attack).

MSOA – middle layer super output area – a medium area of geography used by the UK Office for National Statistics since the 2001 Census, with an average population of around 8,500 persons.

NAO - National Audit Office.

NDTMS - national drug treatment monitoring system - a database of drug treatment data.

NHS – (UK) National Health Service.

NICE - the National Institute for Health & Care Excellence.

NPS - novel psychoactive substances e.g. mephedrone.

NRT - Nicotine Replacement Therapy.

NSMC - national social marketing centre.

NSP - needle and syringe programmes, whereby drug users can obtain clean needles and syringes.

NTA – (UK) National Treatment Agency for Substance Misuse – was subsumed into Public Health England in 2013.

NTORS - National Treatment Outcome Research Study, a large scale study into drug treatment carried out in England and Wales between 1995 and 2000. See also DTORS

NWPHO - North West Public Health Observatory.

OCU - opiate or crack user - see also PDU.

OECD - organisation for economic co-operation and development.

OU - opiate user.

PbR - Payment by Results.

PDU - problematic drug user - usually means an opiate or crack cocaine user.

PHE – Public Health England.

PHOF – Public Health Outcomes Framework.

PIED - performance and image enhancing drugs (same as IPED).

PRIME - theory of motivation, stands for plans, responses, impulses, motives, evaluations.

PROMs - patient reported outcome measures.

QALE - quality adjusted life expectancy (see also QALY).

QALY – quality adjusted life year, a summary measure of health and quality of life.

QOF - quality and outcomes framework - a mechanism by which GPs are paid to measure information about their patients such as disease prevalence and to manage long term conditions.

QoL - quality of life.

RCT - randomised controlled trial.

SCNR - successfully completing and not representing, typically referring to an individual completing drug treatment and not representing within six months.

SMN - substance misuse nurse.

SROI– social return on investment.

SWEMWBS - Short Warwick-Edinburgh Mental Wellbeing Scale.

TB – tuberculosis.

TIA - transient ischemic attack, often called a 'mini stroke'.

TOPs - Treatment outcomes profiles - outcome measurements for drug and alcohol treatment.

TTO – time trade-off (method of eliciting preferences).

UK - United Kingdom.

UKFPH - United Kingdom Faculty of Public Health.

US - United States of America.

VAS or EQ-5D-VAS - Euroqol 5 dimension (3 level) visual analogue scale.

WEMWBS - Warwick-Edinburgh Mental Wellbeing Scale.

WHELCS - Wirral Health Economic Life Cohort Smoking model.

WHO - World Health Organisation.

WTP - willingness to pay.

YLD - years of life lived with disability.

YLL - years of life lost.

Chapter 1. Introduction

1.1 Why Choose This Topic?

This topic was chosen in the belief that health economics and public health should be natural bedfellows. Both disciplines have a population approach and both aim to put healthcare into a wider context of promoting health and wellbeing. Both aim to look at programmes over a long time horizon rather than short term end points. Both aim to put a check on the medical and pharmaceutical view of health which has been seen as too narrow and mechanistic, ignoring individual differences, the impact of context, and looking at health itself rather than the welfare and change in capability people derive from it.

Public health policy makers are keen for interventions and programmes to be based on best evidence. But just because a programme is evidence-based does not guarantee it will be cost effective. Any programme that is suboptimal has an opportunity cost; if a programme costs £60,000 and does not generate any benefits it is not just £60,000 wasted; the benefits forgone by not investing in a better programme may have been valued at much more than £60,000. When public health interventions are assessed they usually come out as much more cost effective than traditional clinical health interventions. But historically public health and health economics have not been used together at a local level; this may be because of a lack of skills or resources at a local level or lack of a perceived need for it. It could also be due to distrust in the public health profession around economics and a feeling that public health outcomes are difficult to measure using conventional methods. Public health has its recent history in socially progressive, community approaches and reducing health inequalities. Public health may see economic theory as part of the cause of health inequalities as economic policies have “wiped out” traditional industries and split communities; practitioners may see economics as part of the problem rather than part of the solution.

This thesis aims to bridge some of this ideological gap between health economics and public health, using realist evaluation techniques to account for some of the differences in contexts and implementation that are present in the services evaluated in this thesis. Local data has been used where possible in the modelling so that any models are optimised for the local context. This thesis aims to elucidate and demystify a set of techniques that can be used to evaluate public health interventions. The interventions in this thesis are all for addictive behaviours; namely drug addiction, alcohol dependence, and tobacco addiction. These behaviours are typically characterised by cycles of relapse and recovery, and investments in services to help people often have cross sector effects, meaning that investments by local

public health teams generate benefits in other sectors of the economy; for instance, treating drug addicts reduces crime. These are complex interventions in complex systems which can be context-dependent in how they work. This means that classic positivist techniques like randomised controlled trials and models carried out in isolation can be limited which is where realist evaluation comes in. This thesis is about bringing theories together to get a set of robust but practical techniques for evaluation.

The primary hypothesis is that economic evaluation represents an essential methodological paradigm that must be used to inform local decision making in public health. This thesis will utilise a series of case studies undertaken by the author to illustrate the value of utilising a health economic approach to determine the cost-effectiveness of public health services in Wirral, an area in the North West of England with a population of approximately 330,000 people. The analysis of the impact underlying public health service provision will not simply be concerned with utility maximisation (cost effectiveness) but will also analyse impact in terms of benefitting the community and reducing health inequalities. The data generated within this thesis was directly used by Wirral public health services to prioritise investment at a time when public health services were being evaluated as part of the recommissioning process. The use of a pragmatic mixed methods methodology for evaluating public health interventions emphasises the complexity underlying the evaluation of such services. The multiple objectives underlying public health provision required the evaluative structure to include a range of elements including economic evaluation, realist evaluation and equity impact assessment. The main economic evaluation method used was cost utility analysis, which measures outcomes in terms of cost per quality adjusted life year (QALYs) gained. QALYs are a summary measure of length and quality of life.

Although significant variations exist in the manner in which public health services are commissioned and provided, there are crucial commonalities in approach between different geographical areas. Therefore the results obtained and the methodological approach utilised should be generalisable to many public health commissioners especially because the interventions being evaluated are largely driven by national policy and make up a large proportion of public health expenditure.

At a time of extraordinary constraint in public health expenditure, optimising the value for money obtained for each pound spent is of the utmost importance for public health. This introductory chapter will analyse the history of public health and its link to health economics. In particular it will examine the common population based analysis and outcome focus that the two disciplines share and the theoretical basis of economic evaluation techniques and realist evaluation. It will emphasize the particular synergy between the two disciplines and

assess the unique role that health economics can play in evaluating and informing public health interventions.

1.2 A Pen Portrait of Wirral - A Microcosm of the UK?

The Metropolitan Borough of Wirral occupies the northern part of the Wirral peninsula in the North West of England and is the 25th largest local authority in England by population (ONS, 2015a). Wirral is surrounded by water on three sides and thus has a lot of sandy beaches, and also has lots of green space. Wirral used to be a popular leisure destination with New Brighton being a summer destination for tourists. Wirral has two road tunnels and one rail tunnel to Liverpool. The first Mersey tunnel was built in the 1920s and was clad with lead; when they came to build the second Mersey tunnel in the 1960s the authorities knew that lead exposure was bad for workers, unfortunately they chose to clad the second tunnel with asbestos instead. The main urban conurbations in Wirral are around Birkenhead and Wallasey. Birkenhead had a historically very active shipbuilding and dock industry since the 1830s. The docks have fallen into decline since the 1960s and containerisation, while Cammell Lairds shipbuilders are still trading, albeit not employing nearly as many staff as it did in its heyday. The industrial areas of Wirral fell into decline in the 1970s and 1980s as smokestack industries saw a decline nationally. Wirral also has a long established public health programme and is geographically very well defined – surrounded by water on three sides, with one council providing public health services, and with most hospital activity being concentrated in one hospital, Arrowe Park.

Wirral is divided roughly by the M53 motorway into a more affluent and healthy West and South, and a more deprived and unhealthy North and East. This thesis will make reference to some standard geographical units used by UK Office for National Statistics (ONS). These are lower layer super output areas (LSOAs), which each contain around 1,500 people; and middle layer super output areas (MSOAs) which have a population of approximately 5,000 - 15,000 people. At the time of this thesis, Wirral contained 42 MSOAs and 208 LSOAs. This thesis will also make reference to electoral wards which are another constant geography used for local council elections and neighbourhood planning (ONS, 2015b)

Figure 1 shows a map of Wirral by deprivation (IMD 2010) score at LSOA level. There is a clear relationship between certain lifestyle risk factors for ill health and deprivation. Figure 2 to Figure 5 illustrate the relationship between four unhealthy behaviours and deprivation in Wirral. Each point on these charts represents a middle layer super output area (with the prevalence of the behaviour (HSCIC, 2007) on the vertical axis and the spread of deprivation (Noble et al., 2007) on the horizontal axis. We can see that two of the lifestyle behaviours –

smoking, and eating five fruit and veg a day - were very closely related to deprivation. Binge drinking and obesity were not as closely related to deprivation.

Figure 1. Map showing national IMD (Index of Multiple Deprivation) 2010 ranking of LSOAs (lower layer super output areas in Wirral, with wards overlayed.

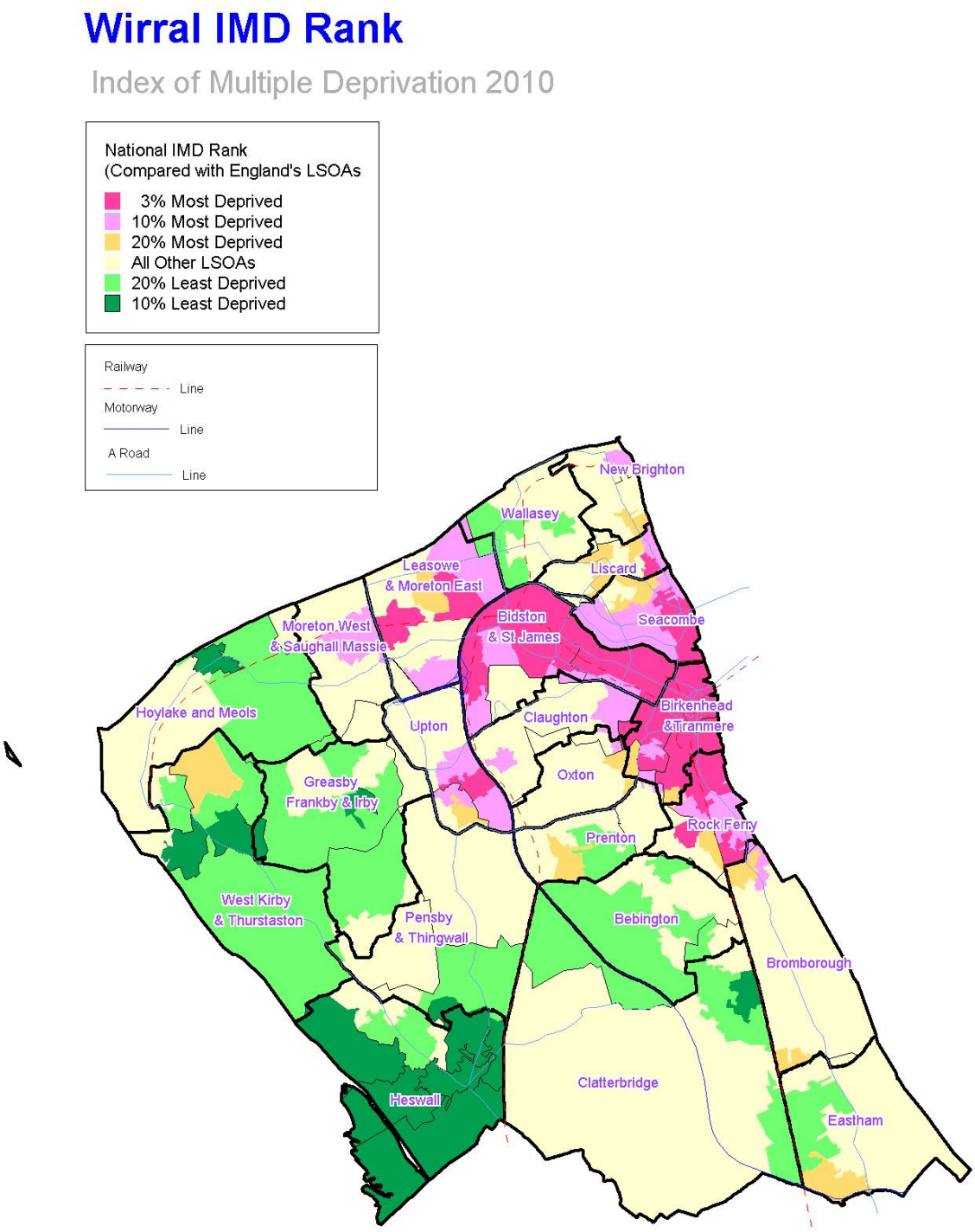


Figure 2. Deprivation against smoking in Wirral.

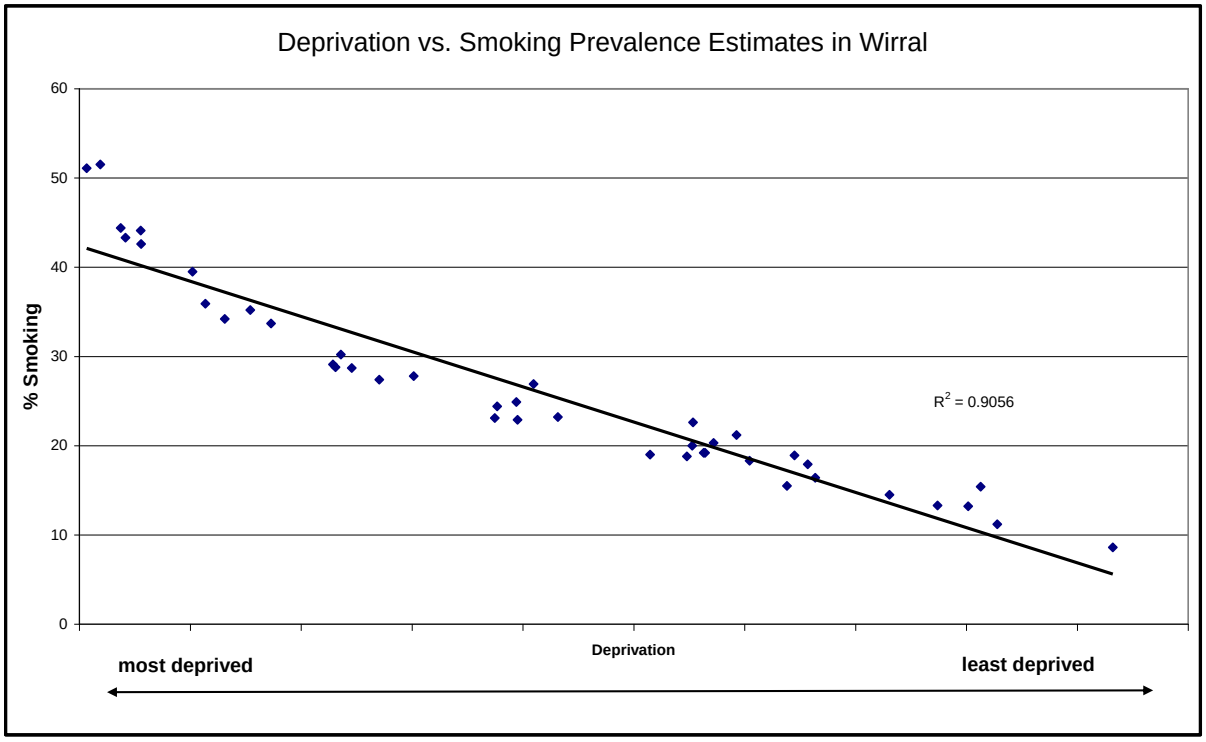


Figure 3. Deprivation against binge drinking in Wirral.

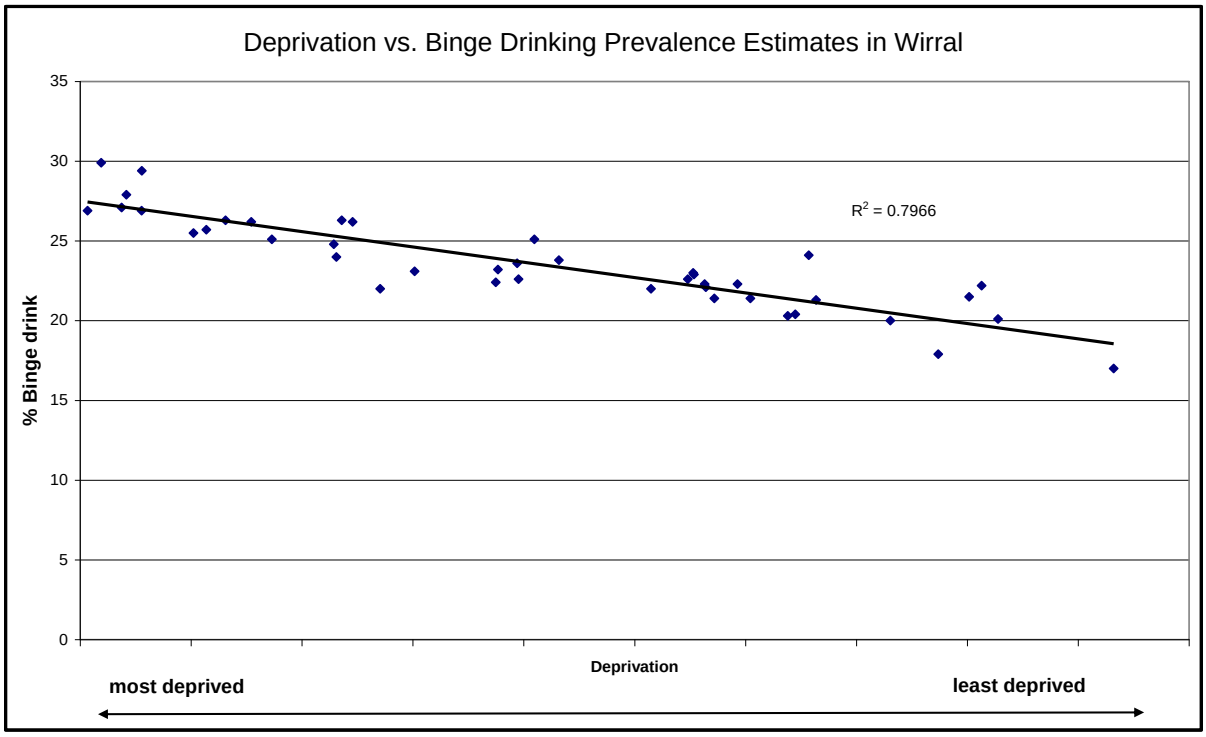


Figure 4. Deprivation against obesity in Wirral.

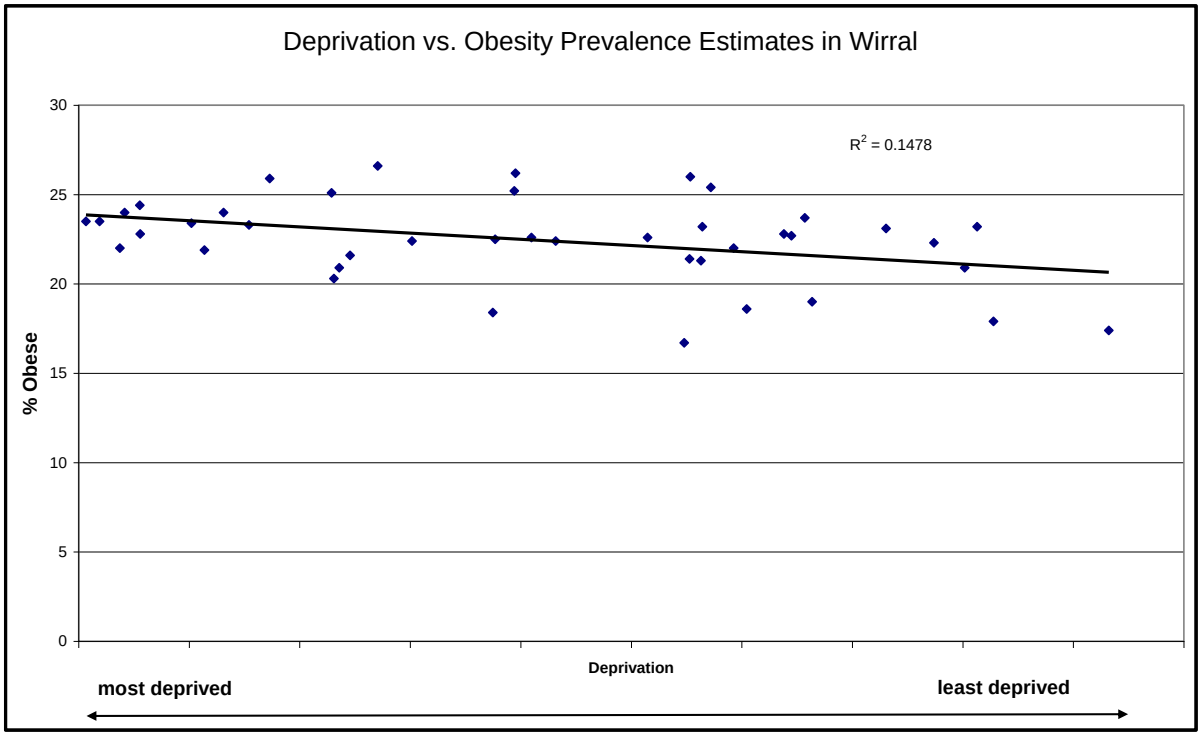
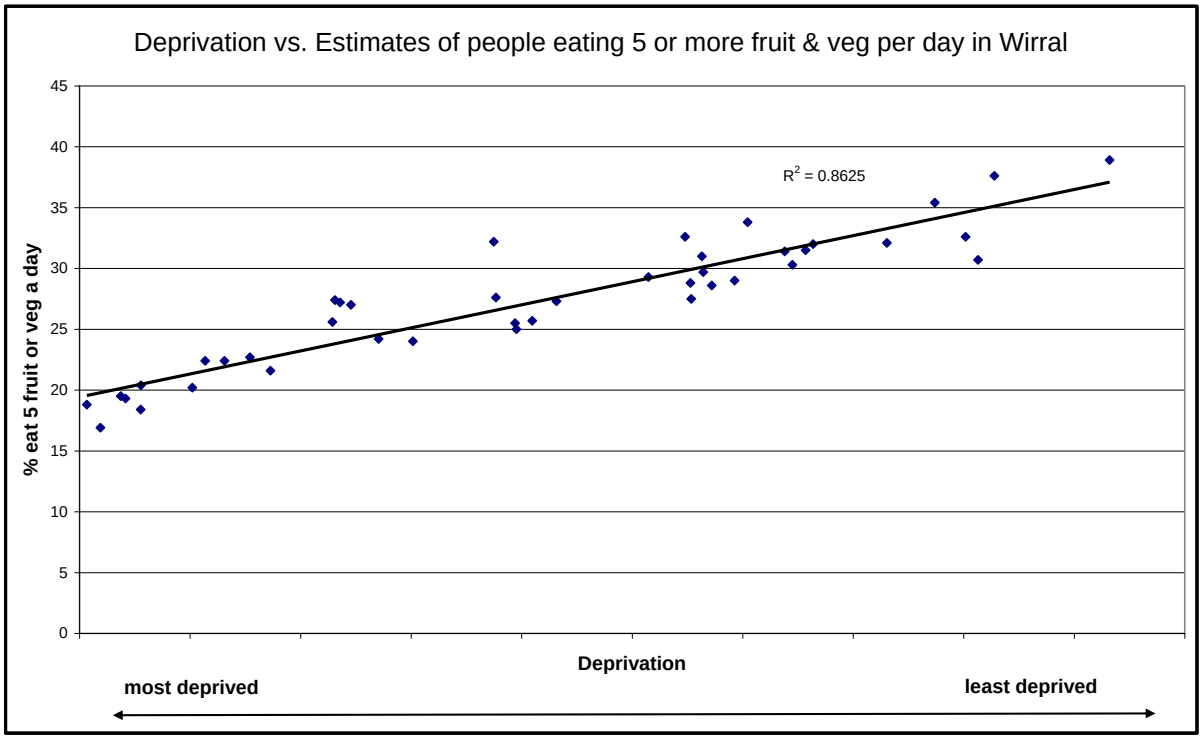


Figure 5. Deprivation against eating 5 or more fruit and veg a day in Wirral.



Data Sources: Model based estimates of lifestyle behaviours from the NHS Information Centre.
Deprivation scores are population-weighted IMD 2007 scores from DCLG.

This thesis employs 'equity impact assessment' methods to analyse the extent to which the uptake and outcomes relating to service provision within Wirral reflects the levels of need in these groups. Mainly this involves focusing on socioeconomic groups, for instance deprivation quintiles, but in certain cases targeting services at specific groups may be important. For example, people with mental health problems are more likely to be smokers so it is important to understand whether they are adequately served in service provision. Retrospective equity impact analysis is similar to equity impact assessment, where a prospective judgment is made as to whether a policy or piece of work will have a detrimental effect on certain vulnerable groups, or whether certain groups need to be given special attention when decisions are made. Because the drugs and alcohol data had only contained partial postcodes, it became necessary to apply approximate string matching algorithms (known as 'fuzzy' matching) to match postcodes roughly to socioeconomic groups. Postcodes for drug and alcohol treatment included postcode sector only, this meant they were in the format "CH41 5" where the full postcode may be "CH41 5AL" so included the outward code and the first digit of the inward code. For each partial postcode there were on average 72 full postcodes, some of which may be in an LSOA that was in the most deprived quintile, and some may not be. Postcodes were classed as being deprived if 50% or more of their postcodes matched up to an LSOA that was in the most deprived quintile nationally.

Table 1. Example of partial postcode matching process.

Partial postcode	N of postcodes not in Most Deprived Quintile	N of postcodes in Most Deprived Quintile	Postcodes not matched	% of postcodes in Most Deprived Quintile	Grand Total	Classed as Most Deprived Quintile
CH41 0	44	33		0.429	77	No
CH41 1		67	1	0.985	68	Yes
CH41 2		96		1	96	Yes

Of course many areas have got internal health inequalities and it is important to state that local authority boundaries can be quite arbitrary and have changed over the years; a local authority may contain or sometimes dissect a set of distinct towns or places. What makes Wirral quite special is that it has a good representation of people from across the income spectrum from the very poor to the very wealthy. Wirral has some of the widest local health inequalities of any local authority area in England, ranking 6th highest for slope index of inequalities in males and 7th highest for females (PHE, 2014a). Wirral has carried out some

local burden of disease work to enable it to understand which diseases are most responsible for the mortality and quality of life gap, similar to the WHO's global burden of disease study (Möller et al., 2012). Table 2 shows the average number of deaths and years of life lost (YLL) by risk factor in Wirral for 2005-07. Smoking is the biggest cause of deaths and of years of life lost. This analysis does not include illicit drug use as a risk factor.

Table 2. Average annual number of deaths and years of life lost (YLL) attributable to risk factors, Wirral 2005-07 (data from Möller et al., 2012).

	Deaths			**YLL**			**Ratio**	
	Male	**Female**	**Both**	**Male**	**Female**	**Both**	**YLL/ deaths**	**Male/ Female**
Smoking	390	419	809	5009	4711	9720	12.0	0.9
Overweight and obesity	98	87	185	1387	1036	2423	13.0	1.1
Insufficient exercise	67	79	146	752	737	1489	10.1	0.8
Low fruit and veg	68	59	127	880	596	1476	11.6	1.2
Alcohol	82	38	121	2265	1026	3291	27.4	2.2
Total	**705**	**682**	**1388**	**10293**	**8106**	**18399**		

1.3 Structure of the Thesis

This thesis analyses the manner in which economic evaluation techniques can be used to appraise public health interventions, specifically around the treatment of addictions. The aim of this thesis is to show how applying economic evaluation methodologies to public health programmes can improve commissioning and policy decisions. In terms of scientific philosophy, this thesis uses a post-positivist paradigm and applies health economic techniques as part of a mixed methods approach. Realist evaluation has a realist paradigm but this thesis does not completely subscribe to this, for example, as it contains quantitative point estimates of cost effectiveness which would not be appropriate under a realist paradigm.

The first four chapters provide an introduction to this thesis, its primary focus and theoretical basis and how it adds to knowledge in this area. The second chapter provides a brief history of public health and addiction research in particular and the third chapter outlines the history of the discipline of health economics and its role in informing and improving decision making in the field of public health. The fourth chapter outlines more of the theoretical basis of the work and the policy implications of the results.

The three case studies all analyse interventions aimed at ameliorating the impact of some form of ‘addiction’. As such the thesis will analyse the theoretical background and practical approaches to addiction theories and emphasize the importance of evidence based evaluation in evaluating public health interventions. Chapters 5-7 will outline in detail the case studies for the three services that have been economically appraised and the results for each service. Each chapter will comprehensively reference previous work undertaken in these areas and emphasize the policy implications of the results obtained where it is relevant to the service being reviewed.

This thesis represents the culmination of over eight years of research undertaken by the author evaluating public health services in the North West of England and in London. The author is widely published in this field and is a member of a NICE Public Health Advisory Committee. The aim of the thesis is to generate and disseminate a practical, theoretical and methodological approach to the evaluation of addiction and more generally public health using the tools and methodologies of health economics.

Chapter 2. History of Public Health & Addiction Research

2.1 What is Public Health?

This chapter summarises the history of public health and addiction research in the UK. Perhaps the first issue to address regards terminology; what is public health? The World Health Organisation (WHO) define public health as "all organized measures (whether public or private) to prevent disease, promote health, and prolong life among the population as a whole" (WHO, 2013) The United Kingdom Faculty of Public Health (UKFPH, 2013) adopts a similar definition; "the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society". There is little contradiction between these definitions, the main differences being that the UKFPH definition focuses on wellbeing and the efforts of society while the WHO mentions private measures, i.e. those measures taken by individuals. There is also an economist's definition of public health as in providing health related 'public goods'; meaning health goods like vaccinations, sanitation & clean air that benefit everyone, and that the private sector would not provide (Smith & Petticrew, 2010).

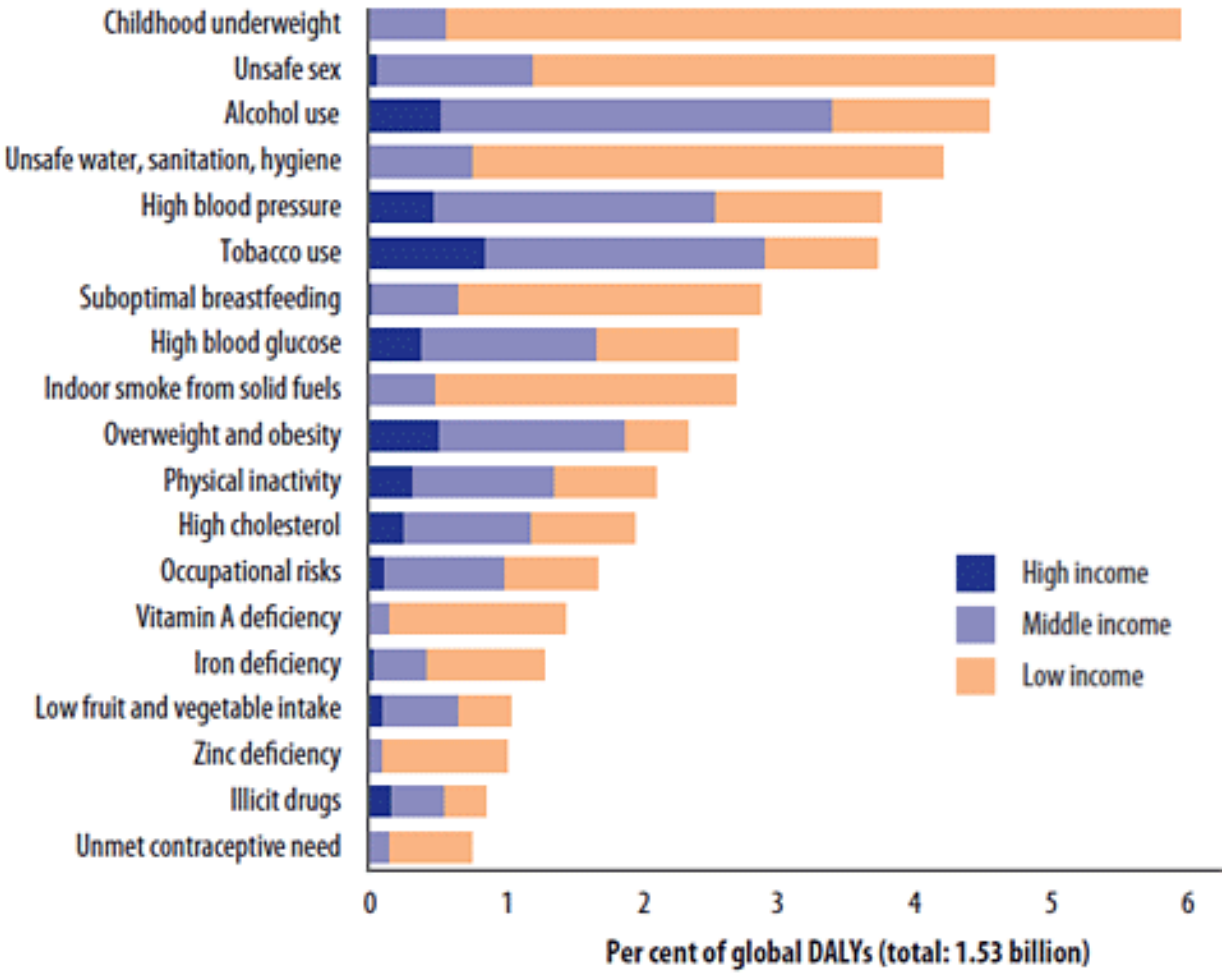
If public health is a discipline for promoting health and wellbeing of populations, then public health interventions or programmes are those which achieve improved health and wellbeing for a population. However, the exact boundaries of public health are open to debate. For example, paying monetary benefits to someone who is out of work will usually go towards maintaining their level of health and wellbeing, but this would not normally be considered to be a public health intervention in the strict sense of the term. Public health interventions are normally interpreted as being health interventions undertaken at the population level, such as vaccinations and immunisations, or those aimed at the maintenance of population health and wellbeing. For example, the widespread use of statins as a primary prevention measure to lower people's cholesterol and reduce their risk of cardiovascular disease is an example of an intervention which is clinical and individually based but which also has a significant impact on the health experience of the population as a whole. As a primary prevention measure, statins are prescribed to healthy people with a higher risk of developing cardiovascular disease in the future, and therefore can be perceived as being a public health intervention as it involves reducing risk rather than reducing symptoms (Law et al., 2004). Many other public health interventions are about reducing risk. For instance, not everybody who is obese will end up with an obesity-related disease. In fact, the evidence is that around a third of obese people are metabolically healthy (Wildman et al., 2008). However, statistically, effective population level interventions will produce a reduction in obesity related

diseases overall even though it may not be possible to determine which individuals have actually benefitted from the intervention. While clinical interventions treat individuals whose health has already been damaged and where adverse symptoms are already being experienced, public health interventions concentrate on 'upstream' population measures (Cookson et al., 2008). The public health interventions considered in this thesis all incorporate interventions (normally pharmacological) for specified individual clients; for example opiate users are often prescribed methadone or buprenorphine and people quitting smoking are often prescribed nicotine replacement therapy (NRT), varenicline (Champix) or bupropion (Zyban). People with alcohol dependence are supported by pharmacological interventions aimed at reducing cravings and anticonvulsants and vitamins during the period of detoxification. Such clients will also be provided with 'psychosocial' interventions aimed at addressing their addictive behaviours and personalities. This multifaceted approach emphasises the complex nature of the health problems addressed in this thesis and illustrates the need for equally complex interventions provided within a complex system to adequately support the needs of the individual clients.

The effective targeting of public health interventions requires an understanding of which risk factors and diseases impose the greatest burden on the population being served. The WHO have carried out a Global Burden of Disease study to estimate the years of life lost, and years lived with disability, due to different risk factors. These years of life lost (YLL) and years lived with disability (YLD) are summarised together as disability adjusted life years (DALYs).

Figure 6 shows the percentage of global DALYs lost due to different risk factors. The biggest problem in low income countries defined in this manner relates to childhood malnutrition, followed by unsafe water, sanitation and hygiene and unsafe sex. In comparison the greatest burden imposed on populations in high income countries relates to tobacco, followed by alcohol and weight, food and physical activity related factors. The services evaluated in this thesis therefore specifically address risk factors (tobacco, alcohol and illicit drugs) which impose the highest burden on population health in advanced countries. However there are several important risk factors not included in this; for instance not all pollution is included, nor is social isolation (Cacciopopo & Hawkley, 2003).

Figure 6. Global DALYs (Disability Adjusted Life Years) Lost Due to Different Risk Factors. Source: WHO (2009).



2.2 A Recent History of Public Health in the UK

Public health research has a long history. This section will focus on the recent history of public health focusing on key policy milestones and the continuing objective of reducing health inequalities. The British Government's policy document "Prevention and Health: Everybody's Business" (DHSS, 1976) followed on from a postwar movement around the social determinants of health. This report was seen by many commentators at the time as putting too much emphasis on individual behaviour being responsible for health problems, and being light on policy answers (Davison et al., 1992). In 1978 the WHO published the 'Alma Ata Declaration' with the goal of "Health for all by the Year 2000" (Fendall, 1978)

which said that health should be an objective of economic development and not just a cause of it; this was also when the "Healthy Cities" movement began. In the UK since the 1970s there was the “white collar revolution” where more people were employed in office jobs rather than manual jobs, which meant that literacy and numeracy skills were more important, and that jobs were more sedentary and less physically demanding.

The Black Report on health inequalities (Black et al., 1980) was commissioned by a politically left wing Labour government in 1977 but not published until 1980 when the more right wing Thatcher-led Conservative government had taken power, and was famously published on August bank holiday with only a small number of copies printed. The government rejected the main findings of Douglas Black's report that health inequalities were mainly caused by structural income inequality and were getting wider and moreover, that something should and could be done about it (Singh-Manoux et al., 2003). In particular the report recommended increased public expenditure at a time when it was being cut. In Thatcher's first speech as party leader she said British people should have "the State as servant and not as master" so it is not a surprise that her government did not believe in large scale interventions to reduce health inequalities. However despite this rejection by the government, the Black report became hugely influential and was used as a blueprint for the OECD in investigating health inequalities. Reading the Black Report and subsequent reports on health inequalities in the context of Piketty (2014), both support the suggestion that apart from economic shocks from the two world wars, income inequality will always increase as the returns for people who are born into wealth will always exceed the returns for those who are not. This theory could equally be applied to health inequalities as people with more money will have healthier lifestyles. This is the inverse care law in action. Richer people can also afford private healthcare, and are better educated to notice the signs of ill health, and possibly have a less fatalistic attitude around health and think of their health on a longer time horizon (Davison et al., 1992). There are wide variations within England of life expectancy at birth (data from ONS, 2010-12) which varied by 8.9 years in males (between Hart, 82.9 years and Blackpool, 74.0 years) and by 7.1 years in females (between Purbeck, 86.6 years and Manchester, 79.5 years). Such variations related to deprivation are also evident within smaller geographical areas. This is strongly evident within Wirral which exhibits a large difference of 14.6 years for males and 9.1 years for females (based on Slope Index of Inequality data for 2012) implying that Wirral has some of the widest internal inequalities in the country.

In the 1980s the HIV outbreak affected western countries as well as developing countries, and brought the focus of public health back on infection control. One route of transmission

was through injecting drug users, who are considered in this thesis. Indeed one of the reasons that drug treatment services were set up and deemed to be cost effective was to reduce the risk of a HIV outbreak moving from injecting drug users to the general population. There were also high rates of hepatitis B and C virus transmission in drug users in the 1980s (Hep C was not known about in the 1980s).

In 1998 the "Independent Inquiry into Inequalities in Health Report" (Acheson, 1998) once again showed that while overall mortality was declining, health inequalities were still very much apparent in the UK. It made several recommendations, including free fruit and vegetables in schools, parenting and relationship classes and tobacco control including banning tobacco advertising, increased tobacco prices, and prescribing of nicotine replacement therapy (NRT) on the NHS. These policy measures around tobacco were key in informing the last 15 years of national and regional tobacco control programmes, which are considered partly in this thesis. Building on the Barker hypothesis, Acheson's report argued that early years were crucial and thus that interventions aimed at women of childbearing age, young mothers and young children should be given priority.

"Our Healthier Nation" (DH, 1999) identified early deaths and health inequalities as a priority. It struck a balance between the social, economic and environmental determinants of health and individual responsibility. This report set out two headline Public Service Agreement (PSA) Targets;

- To reduce by at least 10 per cent the gap in infant mortality between routine and manual groups and the population as a whole by 2010, from a baseline of 1997-99.
- To reduce by at least 10 per cent the gap in life expectancy between the fifth of local authority areas with the worst health and deprivation indicators (the Spearhead Group) and the population as a whole by 2010, from a baseline of 1995-97.

"Choosing Health: Making healthy choices easier" (DH, 2004) included recommendations such as having food labels to show the level of fat, salt, and sugar in foods. It also recommended that health providers and local authorities needed to work in partnership to improve health in their communities and reduce health inequalities. Probably most significantly, it recommended the ban on smoking in public places which began in 2007. This was associated with a reduction in heart attacks (Sims et al., 2010) as well as increasing the numbers of people attempting to quit smoking.

The most recent significant national public health policy document was "Fair Society, Healthy Lives" (Marmot, 2011), the Strategic Review of Health Inequalities in England post-2010.

Michael Marmot had directed the influential Whitehall study showing that lower ranking civil servants had poorer health outcomes than higher ranking ones, even when lifestyle risk factors were controlled for (Marmot et al., 1991). The 2010 review was tasked with identifying the health inequalities challenge facing England, finding the evidence most relevant to future policy and action, and advising on future objectives and measures. This review built on the world-wide evidence accumulated by the World Health Organisation's Commission on the Social Determinants of Health which published Marmot's report 'Closing the Gap in a Generation' (Marmot et al., 2008). Both of these reports said "social injustice was killing people on a grand scale". The Marmot Review reported results from the National Survey of Health and Development which had ran since 1946 and showed that the NHS had not had as great an impact on health inequalities as might be expected; disparities in health by social class that were apparent in childhood persisted into adulthood. The Marmot review recommended some very specific interventions to reduce social and health inequalities which have been acted on somewhat, and influenced the government's Public Health Outcomes Framework (PHOF). Marmot recommended six policy objectives:

- Give every child the best start in life
- Enable all children, young people and adults to maximise their capabilities and have control over their lives
- Create fair employment and good work for all
- Ensure healthy standard of living for all
- Create and develop healthy and sustainable places and communities
- Strengthen the role and impact of ill health prevention

2.3 Summary of Theories of Health Inequalities

We have seen how a lot of public health research and policy has been centred on health inequalities, meaning inequalities in health outcomes, or health inequities, a term which implies a moral judgment that these inequalities are unfair (Dahlgren & Whitehead, 1991). There are several theories of what causes health inequalities. The main ones are as follows (based on p.51-62 from Bhattacharya et al., 2013);

1. Access to care hypothesis – people with more money are more likely to have health insurance or access to healthcare.
2. Efficient producer hypothesis – that disparities in health exist because people of lower socio-economic status often are less well educated, and are less efficient producers of health than people who are better educated.

3. Thrifty phenotype hypothesis (the Barker hypothesis) – that poorer individuals being deprived of nutrition in the womb activates 'thrifty' genes optimised for sparse conditions. When these individuals are then in abundant conditions they develop obesity, diabetes, and heart disease.
4. Direct income hypothesis – health inequalities exist because richer people have more resources to invest in health, so can buy healthier food, gym membership, private healthcare, do not live in polluted areas or damp housing, etc.
5. Allostatic load theory – that health inequalities are related to stress - the cumulative physiological toll from efforts to adapt to life experiences; this is based on the result found in the Whitehall studies where someone's rank is related to health outcomes independent of other health behaviours, and has been found in studies with dominant and subordinate chimpanzees.
6. Income inequality hypothesis – health disparities are caused by income inequality, which is also a source of allostatic load for poorer people.
7. Productive time hypothesis – differences in socioeconomic status are caused by disparities in health. Worsening health reduces productivity which reduces the capacity to produce income.
8. Fuchs hypothesis – (time discounting) differences in health and socioeconomic status are caused by the willingness to delay gratification. Individuals with a lower rate of time discounting are more willing to invest more time now in health or education that will produce continuing health and employment success in the future.

Most of these theories are insufficient on their own to explain health inequalities; for instance in the UK people have reasonably equal access to care through the NHS, yet inequalities still persist. But these theories each have some evidence behind them and some place in explaining health inequalities and have some relevance to the study of addictions. Some of these theories possibly place an emphasis on individual factors and relationships between health and socioeconomic status that may work in a person's lifetime but ignore the fact that income inequalities persist through generations and many individuals only have a limited chance to improve their life chances no matter how much they can delay gratification, or use their time efficiently.

Wilkinson & Pickett (2010) suggested that health and social problems are not related to per capita incomes but rather to the level of equality exhibited in each country or US state. Inequality leads to people feeling like they are not truly an integral part of society if they are not economically included. De Botton (2008) outlines how human beings crave status, which is most often acquired through money and success, and that the media sell people an idea

of beauty and riches that is often unobtainable. This relates to the idea of James (2007) that capitalism is related to poor mental health in populations. These ideas that capitalism and the cult of individualism and consumerism are responsible for poor public health chime with the ideas of Piketty (2014) who called for an international wealth tax to be reinvested in creating a level playing field in order to improve the health experience of disadvantaged populations.

Nettle (2010) proposed that people from lower socioeconomic groups are likely to be exposed to greater risks that are unpredictable so the optimum amount of preventative health behaviour is reduced in comparison to higher socioeconomic groups where health risks are often delayed until old age. In such circumstances less time will be devoted to health promoting activities when there is a higher cause of death from extrinsic causes such as accidents, air pollution, cold weather, and homicide. Nettle argues that early life factors like low intrauterine growth restriction, lack of breastfeeding, and poor diet are essentially extrinsic once someone reaches adulthood as these factors have already harmed individual life chances. Nettle does not specify whether these things affect people in their conscious or unconscious decision making. If it is unconscious then the most important thing is reducing risk factors for extrinsic mortality, whereas if it is conscious then it is important to change perceptions of extrinsic mortality such as fatalistic attitudes or incorrect assumptions.

Some public health interventions like bowel cancer screening may be taken up more by people from more affluent groups, meaning they have the potential to increase inequalities (von Wagner et al., 2011). This has been called the 'inverse prevention law'. But there is a school of thought that says that if interventions work, even if they are initially taken up by more affluent people, the hope is that they eventually get taken up more by deprived groups as well, and additional resource should be put into promoting them to deprived groups or providing advocacy, instead of disinvesting in an effective intervention just because it is not immediately contributing to narrowing inequalities (Lorenc et al., 2013). There is a need to strike an appropriate balance between efficiency- getting maximum health across a population – and equity – getting a fair spread of health across a population - but for commissioning interventions it might depend on the absolute costs as well as the relative costs of putting more resource into deprived areas. Some commentators have argued that where additional investment has been put into deprived areas it has not succeeded in narrowing health inequalities and something different is needed. For instance health action zones in England which started in 1998 did not live up to their objectives, although in part this may be because they were not adequately resourced (Judge & Bauld, 2006).

2.4 History of Addiction Theories

Addiction theory has moved in parallel with public health thinking. For problematic drug users, drug use is characterised by dependence and addiction, where drug taking behaviour becomes unconscious or compulsive and usually causes harm or is risky. In dependent or addicted individuals drug use is often focused on reducing the symptoms of withdrawal rather than getting actual pleasure. There is no one general scientific theory of addiction, although there are factors that are common to most theories. The main theories are broadly biological, psychological, or sociological. Some theories like reinforcement theory (Robinson & Berridge, 1993) explain drug use in humans in general, but not why some humans use and become addicted to drugs and others in similar circumstances do not. Theories have included the genetic predisposition to addiction (Kreek et al., 2005), the idea of people having an 'addictive personality' (Nakken, 1998) or being particularly sensitive to or lacking in certain neurotransmitters or having a metabolic imbalance that is cured by their drug use (West & Brown, 2013). There is also the theory that people are self-medicating for a mental health problem (Khantzian, 1985), people 'modelling' their behaviour on others (Bandura, 1999), or people not wanting to, or having failed to be part of the typical reward structure that society offers (strain theories) (Agnew, 1992). There is Alexander's (2008) theory about addiction being driven by 'dislocation' where individualism and competition take too much precedence over social ties and group bonding. A common theme to Wilkinson & Pickett (2010) and Alexander (2008) is how modern capitalist societies are structured so that people should move to where the work is (the famous Norman Tebbit (mis)quote of "get on your bike and look for work"), but this means that people lose their social ties and their traditional culture. This is why Alexander thinks that "dislocation", the loss of traditional place, culture and family and social bonds that he associates with a free market society, is the main cause of addiction. Alexander talks about there being a conflict between individualism and being a part of a community; drugs often divide communities. Wirral as a case study may be an argument against the 'dislocation' theory as it was an area with relatively stable, tight-knit communities, albeit hit by labour market shocks (Parker et al., 1988). Kushner (2000) outlines personal evaluation and case studies as a useful way of understanding the tension between individuals and communities. A lot of recent research has focused on the relationship between social isolation which can be a cause and consequence of drug use, and the relationship between adverse childhood events and drug use. There are also theories that focus not on the drug taking behaviour, but on why society reacts to the behaviour in the way it does.

Nakken (1988) talks about how addiction is the progressive replacement of people by things where people form relationships with objects and events. This is caused by people relating to others as one dimensional objects; then when people “let them down”, they learn to rely only on objects for pleasure. Addiction generally offers a predictable mood change. Gambling or taking drugs “does not let you down” like people sometimes do. Parker et al. (1988) was a daguerreotype of heroin users in Wirral in the mid-1980s, where users spoke about 'friends' as the people they were friends with before they started using while the people users associated with once they became heroin addicts were never described as friends, they were always “this guy round the corner”. Nakken says that addicts mistake the intensity of an experience like their first experiences with alcohol, or a big win while gambling, with the intimacy and self-actualisation they are searching for in a genuine human experience. Much of what Nakken expresses is intuitively compelling, but does not thereby imply an accurate explanation of addiction. Nakken believes that addicts can transfer their addiction from one object to another object, or from one event to another event. Some people believe that when people have an addictive personality they are always going to be addicted to something, so there is a need to transfer the addiction from something harmful like heroin, to something less harmful like going to the gym. This is a convenient way of thinking of things but people can often acquire multiple addictions one after the other, and be addicted to multiple drugs or behaviours at the same time.

Two influential behavioural theories from the last ten years are the PRIME theory and the COM-B system. These are both general models with applications that go beyond classical addiction theories and have been used across public health. The PRIME theory of motivation (West, 2007) has three central ideas;

1: It is wants and needs at each moment that drive our behaviour.

2: Our intentions and beliefs about what is good or bad only influence our actions if they create sufficiently strong wants and needs at the relevant moment.

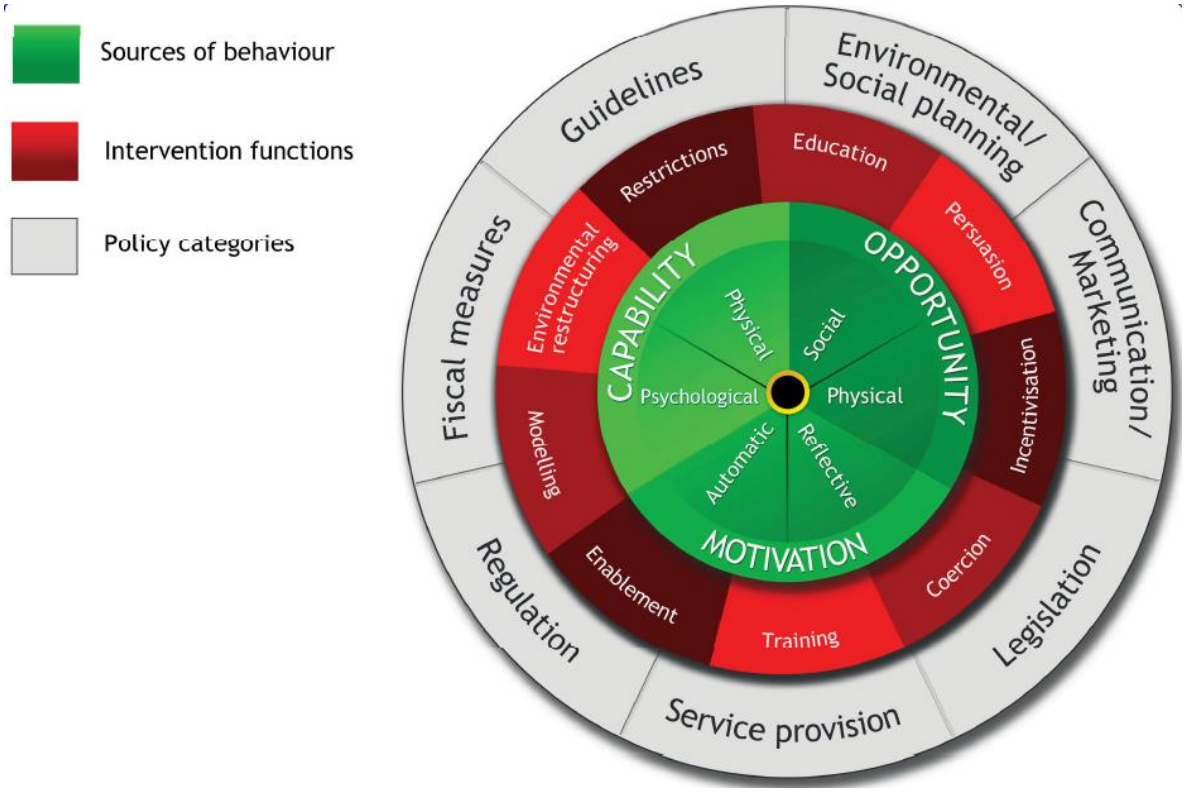
3: Our image of ourselves and how we feel about that, our identity, is a potentially very strong source of wants and needs which can be enough to overcome ones arising from biological drives such as hunger.

The PRIME theory emphasises the importance of subjective identity - if someone does not see themselves as a drug user anymore then they will not use drugs. In drug treatment, people are often said to be ‘in recovery’ for the rest of their lives, which gives them an

identity that they share with other people, but maybe this is not desirable where people want to make a clean break from their past.

A relatively new system which may be useful is the COM-B (capability, opportunity, motivation – behaviour) (Michie et al., 2011). The COM-B system builds on the PRIME model and is thinking about the interaction between **capability**, the physical and psychological ability to do something, such as the ability to inject oneself; **opportunity**, the physical and social opportunity to do something, such as being able to buy alcohol in one's street, or being at a party where cocaine use is socially acceptable; and **motivation**, the reflective and automatic processes that energise behaviour, so if someone believes cannabis is harmless they will not be motivated against using it, or the euphoria associated with smoking crack cocaine will motivate someone towards using it. These three factors, capability, opportunity and motivation, will act to either constrain or to promote behaviour. Therefore any intervention to reduce harmful behaviour needs to look at reducing the capability, opportunity or motivation for this behaviour. Figure 7 shows the COM-B behaviour change wheel which lists sources of behaviour, intervention functions and policy categories. COM-B has been constructed from attempting to collapse down many of the existing behavioural theories into categories and may have a lot of potential. The COM-B framework could be used in realist evaluation as a set of categories for programme theories or for understanding mechanisms which could therefore be used as a taxonomy for interventionist policies.

Figure 7. The COM-B Behaviour Change Wheel.



2.5 Criticism of Addiction Theories

Some researchers believe that addiction is not real, that it is a social construct like property or the economy. Furthermore they believe that the idea of addiction suits addicts and their families as an excuse for their behaviour, and suits people working in the field of addiction. But individual scores on addiction scales like the Fagerström (1978) nicotine dependence scale do predict success at quitting tobacco so this suggests that addiction can be measured and it is a real phenomenon (Heatherton et al., 1991) although it could perhaps be argued that measurement of 'addiction' could in fact be measuring something else like motivation that does not encapsulate the most common criteria of addiction. There is evidence that people who are more likely to quit smoking are more likely to support policy measures against smokers, suggesting that they are anticipating their move from being a smoker to being a non-smoker, or that they want some 'tough love' interventions that will make it harder for them to continue their behaviour (Hammar & Carlsson, 2005). The behaviour of people who are addicted suggests that they try to stay away from stimuli that trigger their behaviour which may indicate a realisation that their behaviour is driven by unconscious triggers.

Heyman (2010) has been influential in framing addiction as being a choice and points out that if addiction is seen as a mental illness then it actually has one of the highest recovery

rates. Heyman (2010) advocates more punitive interventions that emphasise behavioural economics rather than the following the medical model. He deconstructs the idea that because addictions are mostly self-destructive, they must be involuntary and involve some kind of illness. He conceptualises addiction as using 'local bookkeeping' rather than 'global bookkeeping', which is similar to emphasizing short term over long term gratification. Under Heyman's way of thinking, using drugs over the short term always brings higher value (in terms of short term pleasure or local bookkeeping) but this value diminishes over time (with tolerance) and at the same time the value of nondrug activities diminishes over time because having the capacity, the social buy-in and the money to enjoy non-drug activities reduces as well. So as you use drugs, you may enjoy it at first, but as your use becomes your life, the value of other activities becomes lower because you may have lost your friends & family, your employment, or money to engage in leisure activities. This chimes with other research that has shown how levels of psychological and social capital are predictors of remission from dependence (Bischof et al., 2001). In other words if someone has enough people who care about them, and people to care about, they are more likely to conquer their addiction.

Heyman proposes that individuals need to be taught about 'global bookkeeping' to lead them to rational lifestyles. This may be essentially about delayed gratification and self-control. We know that drug users struggle to delay pleasure and are impulsive. Addiction can be seen as an impulse control disorder. That is why addicts often share contaminated needles rather than wait until they have obtained clean needles. It could be argued that much of Heyman's theory is not new, and that most drug treatment does involves instigating a thought process around thinking more long term, and thinking about pleasurable activities that do not involve drugs. It could also be argued that a lot of the social gains that drug users "miss out on" are due to the stigma, criminality, financial cost and social constructs that society puts on drug use, some of which (the financial cost and criminality but not all of the stigma) are cut out in the case of substitution programmes like methadone maintenance.

There are also economic theories like the 'Theory of Rational Addiction' (Becker & Murphy, 1988), which talks about individuals aiming to maximise utility between short term pleasure (which could be gained from drugs or other things) and long term pleasure. It is essentially saying that individuals with a short time horizon will maximise utility through short term pleasure but that in their own way of thinking this behaviour is rational, and that 'addictive capital stock' increases over time which increases the utility that people get from drugs and other substances. Under the theory of rational addiction, addictions to some things like jogging or religion can be beneficial because they increase capital stock, whereas alcohol or heroin addictions are harmful because they reduce capital stock. The theory of rational

addiction uses economic phrases like stock, capital, consumption and depreciation to represent psychological variables. It is true that prevalence of addictions in populations is affected by price and availability, and substitution occurs. But the theory of rational addiction does not account for some of the neurobiological evidence around drugs and tolerance, for example some drugs like cocaine actually become more potent to individuals over time as the neuroreceptors are up-regulated and an individual's brain gets more sensitised to the drug effects (Nader et al., 2002), whereas other drugs like heroin or cannabis cause increasing tolerance over time.

2.6 Summary of Addiction Theories

Understanding addiction theories is useful for framing evaluations and in realist evaluation is useful for starting to think about the contexts, mechanisms and outcomes associated with treatment of addictions. This chapter has discussed the most prominent addiction theories and the history of addiction. To summarise, the elements of addiction that are most important are that addiction is about compulsive behaviour (whether or not it is neurologically similar to obsessive compulsive disorder or not) and treatment is about breaking the compulsion. Addictions are often present with other mental health problems and are often correlated with adverse childhood events, poverty and economic shocks, and a lack of community or displacement. Most economic benefits from treatment of addiction fall to the criminal justice system, as a result of drug & alcohol users committing fewer crimes (McCollister & French, 2003) and this, rather than improving individual quality of life, is usually the imperative behind funding treatment of addictions. However in the case of tobacco addiction many of the benefits fall to the healthcare system. Taking all of these things into account is useful for treatment. There is an argument that addiction theories that major on moral judgements may not be helpful for the scientific study of addiction, even if they work for individuals. Because many individual addicts are aware of the language of addiction theories, understanding the real mechanism through which individuals recover can be difficult, as their descriptions can be driven to an extent by the discourse in the theories and ideas they know about (Hanninen & Koski-Jannes)Once addiction theories gain traction with academics, practitioners, drug users or the population then these theories can exercise a latent power.

2.7 The Structure of Public Health in the UK

Local specialist drug, alcohol and tobacco treatment services are provided by local authority public health teams in England. Understanding the public health profession is important in knowing the chain of command in terms of implementation and the multidisciplinary

approach taken. In the UK, public health practice is led by the Faculty of Public Health (UKFPH). Public health policy is led nationally in England by Public Health England, which took on these functions from the Department of Health in 2013. Local Directors of Public Health are responsible for leadership across the three domains of public health; health improvement, health protection and healthcare public health. Treatment of addictions mainly falls under health improvement. Since 1988, Directors of Public Health (DsPH) have produced annual reports detailing the state of public health in their areas. From 2001 the DsPH were based in NHS Primary Care Trusts, until 2013 when they moved into local authorities. Since 2007 each area has been required to produce a Joint Strategic Needs Assessment (JSNA), which is both a process and a document to assess and describe in detail the health and social care needs of the local population, which is meant to inform the health and social care commissioning process.

In England, local public health teams moved in 2013 from being in the NHS to being in local authorities. Before this, most had worked together closely with local authorities. Local public health teams provide leadership and strategy across the local authority on health issues and work with the local Health & Wellbeing Boards which provide leadership across the public sector. They are responsible for planning and have staff on call for local public health emergencies (such as disease outbreaks, large fires, chemical leaks or other major incidents). They also commission services such as sexual health services, weight management, smoking cessation, drug & alcohol treatment, and often many smaller services to meet specific needs. Many public health departments also provide some services themselves although since around 2007 the commissioner-provider split has become greater, and public health teams are subject to a lot more regulation around how they tender for services. In terms of statutory functions for local authorities, as of 2014 these are;

1. Weighing and measuring of school children (the national child measurement programme or NCMP).
2. Make arrangements to provide health checks for eligible people – the regulations also specify what information needs to be recorded.
3. Make arrangements for open access sexual health services.
4. Make arrangements for the provision of a public health advice service which should be agreed between the local authorities and clinical commissioning groups (CCGs). This means public health teams providing advice to CCGs around health needs assessment, demand and capacity planning, and on commissioning.

5. Provide advice health protection arrangements against threats to the health of the local population, including infectious disease, environmental hazards and extreme weather events.

(Heath, 2014)

Compared to other parts of the NHS and other local authority services, there is a lot of variation in what is spent, provided and commissioned in terms of local provision in public health. For example, some areas spend in excess of £1million per annum on weight management services, while some areas have only very small-scale services which cater only for people who are eligible for bariatric surgery. Or in terms of what is provided, some public health teams take lead responsibility for individual funding requests (IFRs) for people requesting treatments that are not routinely provided through the NHS, while in some areas this is done by a committee of local clinicians. Table 3 shows the spend per head (based on total population) on public health categories for Wirral, its statistical neighbours, and England for 2013/14. This data is from PHE (2015). Wirral spends more per head on Public Health than England or its statistical neighbours (£72 per head for Wirral vs. £59 for stat neighbours and £47 for England). Most of this extra spend was on drug and alcohol treatment which Wirral spends much more on than England or stat neighbours.

Table 3. Spend per head (£) on Public Health categories, Wirral, England and statistical neighbours, 2013/14 FY.

Category of spend	Wirral	England	Stat neighbours	Difference Wirral vs. England	Difference Wirral vs. stat neighbours
Sexually Transmitted Infection Testing and Treatment	6.3	7.0	5.2	-0.7	1.2
Contraception	2.2	3.1	3.7	-1.0	-1.6
Sexual Health Advice prevention and promotion	2.2	1.8	1.2	0.4	1.0
Health checks	0.8	1.0	0.9	-0.3	-0.2
Health protection	0.2	0.6	0.9	-0.4	-0.8
National Child Measurement Programme	0.1	0.4	0.2	-0.2	-0.1
Public Health Advice to CCGs	0.0	1.0	1.2	-1.0	-1.2
Obesity - adults	2.5	1.1	1.8	1.4	0.7
Obesity - children	0.7	0.5	0.5	0.2	0.2
Physical Activity - adults	0.1	0.9	1.0	-0.8	-0.9
Physical Activity - children	0.0	0.4	0.2	-0.4	-0.2
Drugs adults	21.8	9.8	12.8	12.0	9.0
Alcohol -adults	9.0	3.5	4.9	5.6	4.1
Substance misuse -youth	1.3	1.3	1.0	-0.1	0.2
Stop smoking services	4.8	2.3	2.9	2.5	1.9
Tobacco control	0.0	0.3	0.1	-0.3	-0.1
Children 5–19 Public Health	7.6	4.5	5.7	3.1	1.9
Miscellaneous Public Health	12.2	7.2	8.1	5.0	4.2
Total	71.9	46.6	52.4	25.3	19.4

Public health made up on average 2.2% of local authority budgets (£2.7billion) in 2013/14. Public health funding allocations are based mainly on the size of the population and an area's under-75 years standardised mortality ratio. The Government have said that the ring fenced grant should be spent on activities to;

- Improve significantly the health and wellbeing of local populations.
- Carry out health protection functions delegated from the Secretary of State.
- Reduce health inequalities across the life course, including within hard to reach groups.
- Ensure the provision of population healthcare advice (Heath, 2014)

Since the public health budget transferred over to local authorities in 2013, there have been concerns expressed about the possibility of public health funding (which was ring-fenced and

protected for three years) being used to plug the gap in other local authority services, particularly as a lot of services like parks, leisure, environmental health could be broadly labelled as 'public health'.

Table 4 shows spend on public health categories in 2012/13 for England. It is clear that drugs and alcohol make up a large proportion of spend (around 31%). Smoking and tobacco control make up around 5.8% of spend.

Table 4. Local Authority General Fund Revenue Accounts 2012/13 for Public Health (£ thousand). From PHE (2015).

Area of spend	**Net current expenditure (2012-13)**	**% of total (2012/13)**
Sexual health services - Sexually transmitted infection testing and treatment	366,912	13.6
Sexual health - Contraception	155,592	5.8
Sexual health - Advice, prevention and promotion	114,109	4.2
NHS health check programme	86,219	3.2
Local authority role in health protection	40,757	1.5
National child measurement programme	22,500	0.8
Public health advice	64,539	2.4
Obesity -Adults	68,183	2.5
Obesity- Children	28,461	1.1
Physical activity - Adults	31,334	1.2
Physical activity - Children	10,953	0.4
Substance misuse –drug misuse	568,767	21.1
- Alcohol misuse	204,080	7.6
- Drugs and alcohol – youth services	54,958	2.0
Smoking and tobacco – smoking cessation and interventions	136,290	5.0
- Wider tobacco control	22,084	0.8
Children 5-19 public health programmes	230,808	8.6
Miscellaneous public health services	492,679	18.3
Total public health	**2,699,221**	**100.0**

Chapter 3. History and Application of Health Economics

3.1 The Background to Health Economics

While public health could be described as a 'happy science', economics has been described as 'the dismal science' (Marglin, 2008). Health economics as a discipline is still young, with Arrow's (1963) paper "Uncertainty and the welfare economics of medical care" credited with being the genesis, with health economics as a discipline really taking off in the 1970s. In the US, health economics was particularly prominent in health policy when national Medicare coverage was extended to include people with disabilities, including those with chronic kidney failure who required dialysis or transplant, and led to a quoted cost-effectiveness threshold of 50,000 US dollars per life year saved (Neumann et al., 2014). Health economics regards health as an economic good and healthcare as a market where unregulated demand will always outstrip supply. Healthcare is therefore scarce. Health economics believes that people derive utility from health. In general economic terms, utility is mainly measured in terms of the results of choices; is it assumed that if people choose something more often they get more utility from it. So if people choose to buy boats over cars then this is because they get more utility from boats; boats are more desirable. However the evidence is that people do not make rational choices; choices are framed in a certain context and changing the choice architecture changes the decision outcomes (Thaler & Sunstein, 2008). So for instance more people are likely to accept a surgical procedure if they are told it has a 90% survival rate, than if they are told it has a 10% mortality rate (Kahneman, 2011).

Health economics is based on Pareto's welfare economics theories. It is also owes a lot to John Rawls' theories of social justice (Dolan, 1998). In welfare economics, if a market is set up well, it should be able to achieve close to a Pareto optimal allocation of resources, a state where one person cannot be made better off without making someone else worse off, which will be guided by 'the invisible hand' (Garber & Phelps, 1997). In terms of economics, utility maximising consumers and profit maximising firms interacting in a perfect competitive environment should achieve optimum utility. In practice there are several optima that can be achieved. This idea of Pareto efficiency is quite impractical in reality and has been criticised by commentators such as Sen who points out that a state can be perfectly optimal but still be "perfectly disgusting" by any standards (Kanbur, 2003). For instance a state where there are wide inequalities in quality of life but where any increase in the quality of life of those at the bottom cannot happen without it being at the expense of the people at the top. We have discussed earlier how the results from Wilkinson & Pickett (2010) demonstrate that inequality affects people across the distribution, not just those at the bottom. So a healthcare market

could in theory be perfectly efficient, but not be seen as being fair. In fact, healthcare markets are far from efficient and exist in a state of market failure (Nicolls et al., 2004).

There are a set of issues that lead to market failure in the healthcare market, which means it does not tend towards maximal efficiency or a Pareto optimal allocation (Pauly, 1986). These issues are;

- Information asymmetry – doctors generally know a lot more than their patients about healthcare issues so they are not savvy consumers.
- Agent relationship – people often access services through a third party agent like a doctor.
- Adverse selection – people in good health are less likely to purchase health insurance (this may be less of an issue in countries like the UK that have universal healthcare).
- Moral hazard – people who have healthcare coverage or insurance may not take steps to keep themselves healthy.
- Use of healthcare is unpredictable.
- Risk of supplier-induced demand.
- Lack of competition in some sectors - e.g. emergency department visits; individuals who have injured themselves seldom think about which is the best value emergency department, they will just go for the one which is geographically closest.
- High transaction costs.
- Externalities – e.g. second hand smoke negatively affects other peoples' health, or immunisation and sanitation benefits others' health.

Many of these causes of market failure were mentioned in Arrow (1963) and have been highlighted in other studies such as the RAND health insurance experiment (Manning et al., 1987). Some of these have limited relevance to public health services and to treatment of addictions, but some have strong relevance and will be referred to as we go on.

3.2 Allocative and Technical Efficiency

Health economics is often concerned with allocative efficiency - allocating resources efficiently between programmes, and technical efficiency - using resources in the best way within programmes. This is also known as horizontal priority setting – choosing between spend on different categories and vertical priority setting – choosing how to spend money within a category. However it can be argued that the difference between allocative and technical efficiency is an arbitrary one which depends on how you decide to slice up the

resources and how you categorise spending programmes. So for instance an allocative efficiency question could be how to allocate money to coronary heart disease as a disease area compared with cancer, but you could also have smoking cessation as an area which impacts on both CHD and cancer. You could also say that allocating resource for preventing cancer cases and deaths compared to preventing CHD cases and deaths is a question of allocative efficiency, but you could also go a level lower and say that allocating resource between bowel cancer and breast cancer treatment is also a question of allocative efficiency, but if the overall outcome is reducing cancer as a whole then maybe looking at resource allocation for different cancers is a question of technical efficiency.

3.3 Egalitarianism vs. Utilitarianism

There has been a debate over whether health economics should adopt an egalitarian approach or a utilitarian approach. An egalitarian approach is aiming for equal opportunity for individuals to enjoy health whereas a utilitarian approach is aiming to maximise health across a population. An egalitarian approach could include reducing health inequalities and possibly a 'fair innings' approach to health, where spending is directed at helping everyone to live to a certain age (Olsen, 1997). Consider for example whether the difference between living to 90 and living to 100 is the same as the difference between living to 50 and living to 60. This approach is controversial.

There is the question of whether people as a whole value collective utility or really put more of a premium on their individual or family's utility. People do altruistic things that improve other people's utilities at the expense of their own (or at least at the expense of their own time). The economic theories behind this are kinsmanship (helping close friends and relatives) and reciprocity (helping others in the hope of promoting cooperation). Does this mean that people are utility maximisers across a population? Some people like Mother Teresa of Calcutta literally devoted their lives to helping others. In "The Selfish Gene" Dawkins (1976) talks about altruistic behaviour in animals including humans and how it relates to genes preserving themselves, sometimes at the expense of their current hosts. It would be interesting to try to measure if this instinct to aim for maximum utility across a population has changed now that societies in general seem to be becoming more individualistic. It might be that the cult of individualism, consumerism and advertising has led to individual human volitions and the power of suggestion becoming more powerful than genes in driving natural selection. Phenomena like addiction could be considered as a symptom of power struggles between genes and their hosts. Maybe our genes mean that our brains are hard wired to focus on the pleasure and contentment from sex, food, taking

care of children and evading predators but this same brain circuitry is shortcut by addictive substances (Bernheim & Rangel, 2002).

3.4 Welfarism and Extra-Welfarism

NICE's *Guide to the Methods of Technology Appraisal (2013)* defines a reference case assumption that all equal-sized health improvements "should receive the same weight regardless of any other characteristics of the people receiving the health benefit" – this is a utilitarian approach, treating QALYs equally rather than treating people equally – although NICE make some exceptions, for instance they allow a higher cost effectiveness threshold for interventions that extend life, which are often cancer drugs (Linley & Hughes, 2013). The utilitarian approach is linked more to an extra-welfarist perspective, where an equal value is put on health across the population, as opposed to in a welfarist perspective where the individual value of health would be measured. With the EQ-5D which is the standard tool used to calculate QALYs, a population time trade-off (TTO) method is recommended to reflect the preferences of local taxpayers and potential receivers of healthcare rather than people who have already got specific diseases, so this is taking an extra-welfarist perspective (Dolan et al., 1996). The time trade-off method involves a sample of the population being given health scenarios and asked how much time they would trade off in a worse health state for a shorter amount of time in a better health state (usually perfect health). So if someone is given a scenario of severe anxiety and depression and moderate pain and discomfort they may say that they would trade 10 years in this state for 3 years of perfect health; this health state would have a utility value of 3/10 or 0.3. Alternative methods to time trade-off are standard gamble and discrete choice experiments. Standard gamble is where people 'gamble' on a chance of a better health state against a chance of a worse health state (usually death). Standard gamble appeals more to economists as it better represents the uncertainty inherent in real world decisions, but it can be difficult in reality because people are usually very risk averse in hypothetical situations (Bleichrodt, 2002). Discrete choice experiments involve scoring a set of scenarios so that they can be ranked when individual elements of the scenarios are changed, so it could be determined whether someone would rather lose a little finger than lose a big toe, etc.

This thesis addresses in chapter 7 the issue of welfarism and extra-welfarism in the valuation of health outcomes. In essence extra-welfarism applies a population average value of health while welfarism aims to reflect each person's individual value of health. But the question is do drug, alcohol or tobacco users value health less than other people in the population, and value health less than other things like short term happiness, or being

social? Maybe heavy drinkers or smokers in part become heavy drinkers or smokers because they value the short term social aspect or group mentality from smoking or drinking more than they value the longer term negative health aspects. The time dimension is crucial given that although while potentially offering a short term boost to social acceptance within peer groups alcohol and drug abuse often leads over the longer term to relationship breakdown and social isolation (Perty et al., 1998). But it may be rather that the addiction has crowded out the value of their health, and that health is just one of many things that are dominated by the addiction which may include child rearing, self-improvement, and work.

This is also brings in a productivity argument - do people value health because it allows them to be productive and have money and energy to enjoy themselves and work and take care of their families? In which case you can say that the utility derived from health is correlated closely to the potential economic productivity derived from health. And thus for people with severe drug or alcohol problems, they are less likely now or in the future to be 'productive' members of society by ordinary perspectives (i.e. work, have a family etc.), so does society value their health-related utility less, as well as them valuing their own utility less? This is a controversial argument, and is similar to the controversy when organisations like NICE (although in reality the Department of Health) were seen to be debating whether healthcare rationing should favour younger people, taking into account 'wider societal benefits' (Hope & Martin, 2014). It may be more like the ecological argument from Nettle (2010) that people who become 'addicts' do so because it makes less sense for them to worry about the consequences of addiction when they are already exposed to many extrinsic health risk factors from before birth. We have seen in the results of cohort studies that people exposed to early life risk factors have poor health throughout their lives (Kuh & Shlomo, 2004).

3.5 Health Economic Approaches and Methodologies

3.5.1 Main Methods

Table 5 shows the main health economic evaluation methods that are used today. Cost benefit analysis is often seen as the gold standard as it allows the value of a programme to be compared with other non-health programmes, so we can compare the cost benefit of a cardiovascular risk reduction programme with a road improvement programme, with an education programme. Many senior decision makers in government would love to have this type of comparison to hand. Cost benefit analysis is very valuable in theory but very difficult in practice. This is because it is difficult to establish the willingness to pay or the shadow cost for healthcare, particularly in the UK where most healthcare is free at the point of contact.

Within healthcare, cost utility analysis or cost per QALY is often seen as the gold standard as it allows comparison between health interventions on a common currency so we can compare the cost utility of an oral health improvement programme with a stop smoking service, with hip replacement surgery. Once again this is more difficult in practice than in theory, and the main tools used to calculate QALYs often have some deficiencies, so for example the EQ-5D which is the gold standard tool recommended by NICE, is a multi-attribute scale but is not good at measuring the impact of sensory impairments like blindness or deafness, and is also not good at measuring quality of life in illnesses like chronic lung disease (COPD) that have a pattern of exacerbations and recovery. The EQ-5D is used in PROMs (patient reported outcome measures) to measure the quality of life gains that individuals get from surgical procedures in the English NHS, alongside condition-specific measures.

NICE are often said to have a cost per QALY threshold, whereby they will recommend treatments where the incremental cost effectiveness ratio (or cost per incremental QALY) is less than £20,000, and between £20,000 and £30,000 where there is a high level of certainty about the cost effectiveness (Appleby et al., 2007). For some end of life treatments they may go up £50,000 per QALY. NICE have said that 'a QALY is a tool not a rule' and there are examples of where they have recommended treatments where the cost per QALY is greater than the threshold, including Pemetrexed [Alimta] for the treatment of malignant pleural mesothelioma. Mesothelioma was a disease caused by asbestos exposure which was most prevalent in older manual workers from occupations such as shipbuilding, railway engineering and asbestos product manufacture. Pemetrexed was assessed as having a cost/QALY of c. £60,000 which is above the NICE threshold of £30,000 per QALY gained. Because mesothelioma affected relatively small numbers and affected workers who were mainly from deprived populations NICE approved it but some areas challenged this judgment, so Birmingham East and North Primary Care Trust (PCT) submitted an appeal against this decision arguing that the fact the disease came from occupational exposure should be irrelevant to the decision (Rawlins et al., 2010).

Table 5. Main types of health economic analysis methods.

Economic analysis method	Cost measure	Benefit measure
Cost benefit analysis (CBA)	Money	Money
Cost effectiveness analysis (CEA)	Money	Natural units (i.e. life years gained, change in blood pressure etc.)
Cost utility analysis (CUA)	Money	QALYs (Quality Adjusted Life Years)
Cost minimisation analysis (CMA)	Money	Benefits are equivalent
Cost comparison analysis	Money	N/A – this method merely compares costs
Cost consequence analysis	Money	Lists consequences separately but does not weight them or turn into a summary measure

3.5.2 Social Return on Investment (SROI)

Social return on investment (SROI) is a related concept to cost benefit that often adopts a wider perspective in terms of measuring the value of a programme to different stakeholders (Cupitt, 2009). SROI is about understanding which outcomes a programme has delivered for stakeholders and putting a value on this, often with financial proxies. The main downside of SROI as a methodology being that any SROI ratios (which are similar to cost-benefit ratios) are seen as being specific to the programme in question and not comparable to one another, although can be compared over time within a programme. So if the SROI ratio for a smoking cessation programme is £6 for every £1 spent, one cannot say it is better to invest in this than in a weight management programme where the ratio is £2 for every £1 spent. There is perhaps a danger here of always producing “a Dodo bird verdict” where “all have won, and all shall have prizes”. But if the same methods are used then the ratio could be compared over time, so if in 2015 the ratio is £6.10 for every £1 spent, service managers could look at which areas of a programme deliver the most social value and aim to maximise this so that in 2016 they aim to get £7.50 for every £1 spent. SROI has been used increasingly in the UK since the Public Services (Social Value) Act (HM Government, 2012a) which stated that commissioners and procurers should consider social value when commissioning services,

which in practice means that local public sector commissioners no longer need to go for the cheapest bidder, and can consider additional social value. So if a commissioner is choosing between a national company that will bring their own staff and a charity that will employ local people who have had previous alcohol problems and been long-term unemployed it can consider the additional value rather than just going with the cheapest option. SROI has not been used in this thesis but it may have some promise for looking at public health interventions and has been used to evaluate some addiction services. SROI is not overly prescriptive but uses some useful techniques in stakeholder engagement and in using revealed preference techniques to put a financial value on individual outcomes. The focus on individual stakeholder value, and in measuring value continuously rather than as a one off exercise, are two of the strengths of SROI (Millar & Hall, 2013).

3.5.3 Multi-Criteria Decision Analysis (MCDA)

MCDA is a process for making decisions using a set of criteria. A criterion is a standard against which something can be judged. In MCDA a programme or service can be judged on a set of criteria (for instance outcomes achieved, reach, customer feedback) which are then most often weighted to give a total score for the relative desirability of each service. Services can then be ranked by their total score to give an indication of the relative preference for each service. Like nearly all real world decision processes, MCDA involves an element of subjectivity. MCDA is based on the principle that a low score on one criterion can be compensated for by a high score on another criterion. Anything that is not compensatable in this way should not be a criterion, so anything that is a necessary element should instead be a first stage filter (Lootsma, 2013). We might use a process similar to MCDA when we make decisions in our own lives, so for instance if we are buying a house we may weigh up the things we want against each other; a smaller bathroom may be compensated for by a bigger garden.

Multi criteria decision analysis is an iterative process; it often involves going back to look at the criteria and weightings and adjusting them; this is a natural part of the process. It will also often highlight where there is a lack of information on how certain services meet certain criteria, which can then be collected or estimated and fed back into the process. MDCA is also sometimes called multi criteria analysis (MCA) or multi criteria decision making (MCDM). The Department of Communities and Local Government (DCLG) produced a manual in 2009 (Dodgson et al., 2009). In the public health sphere, the HELP (Health England Leading Priorities) Tool used an MCDA methodology to rank potential public health

interventions. MCDA has not been used in this thesis but have used it in other applications such as in a prioritisation process looking across all local government services.

3.5.4 Economic Modelling

Many health economic evaluation studies involve some degree of modelling. Models are a simplification of the real world and involve abstraction, selection and assumptions. Modelling generally has three main purposes;

1. To combine data from different sources, and in many cases, to create hypothetical populations or scenarios.
2. To estimate long term outcomes (including costs) based on short term (surrogate) outcomes.
3. To account for uncertainty or bias in the data sources.

This thesis will use some of the most common types of models in health economics, namely decision tree and Markov (chain) modelling (Briggs & Schulpher, 1998).

Decision trees are used to compare strategies and calculate their net present value by 'rolling back' or pruning the tree. This can then be used to determine the optimum strategy. Figure 8 shows an example reconstructed from a book; Morris, Devlin & Parkin (2007). This is a decision tree with 2 initial scenarios - surgery or drug treatment. The outcome in this model is QALYs (quality adjusted life years).

The decision nodes (squares) represent decision points controlled by the decision maker (which could be a clinician, the patient or someone else). In this case there are two alternative strategies at the beginning, drug treatment or surgery. And in the drug treatment arm there is an additional decision node where drug treatment has not cured the patient the first time, where a patient can either have counselling or further drug treatment. Decision nodes need to be mutually exclusive, so in this case a patient cannot have drug and surgery, if this was the case then this would require a third branch, labelled 'Drug and Surgery'.

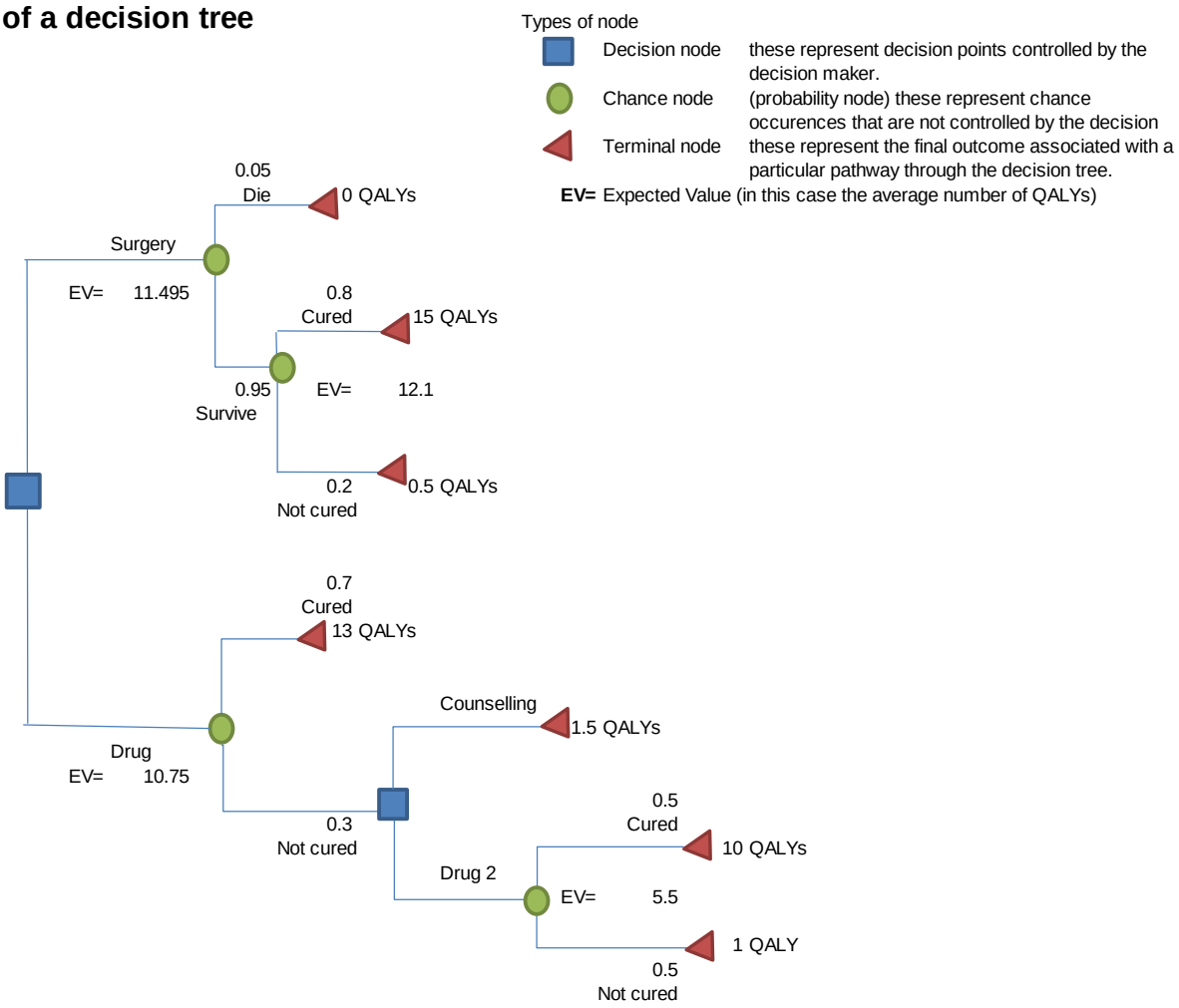
The chance or probability nodes (circles) represent points where an outcome is subject to some uncertainty that is not controlled by the decision maker, so after surgery there is a 5% (0.05) chance of the patient dying, and a 95% chance of the patient surviving. Chance nodes can have more than two outcomes, but they must be collectively exhaustive, i.e. all possible outcomes are accounted for, so if 10% of clients had unknown outcome, it would be labelled as such. The sum of probabilities at any chance node must always equal one. The chance

nodes will also approximate to the proportion of patients ending up with each outcome, if a large simulation cohort is run through the model.

The terminal node represents the final outcome associated with a path through the decision tree, so as an example if a patient has surgery, survives, and is cured they will have a quality adjusted life expectancy of 15 QALYs. If a patient has drug treatment, is not cured, and then opts for counselling then they will experience 1.5 QALYs.

The expected value of a decision is calculated by 'pruning', 'roll back' or 'fold back' up the tree, so for the drug treatment arm, the expected value for someone having drug treatment and if not cured, the second course of drug treatment, would be the sum of the probabilities multiplied by the outcomes at each decision node.

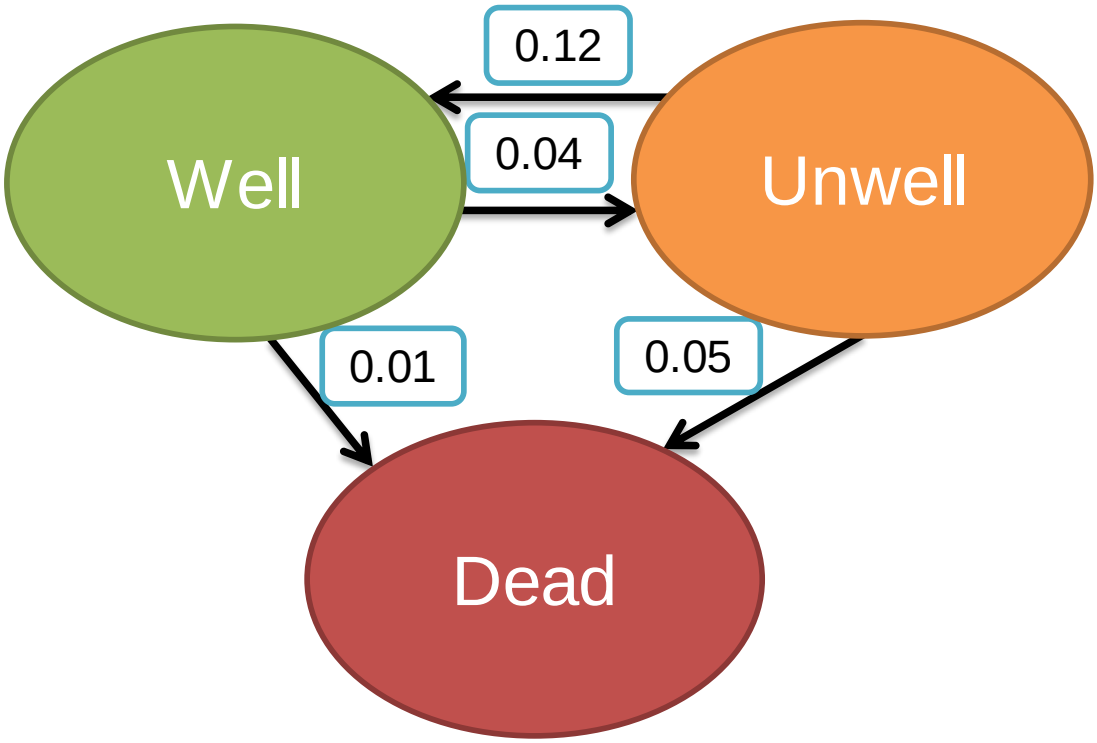
Figure 8. Example of a decision tree for a clinical pathway.



Markov models involve a hypothetical population moving through a set of cycles. Each cycle represents a period of time like 6 months or a year, where at the end of each cycle they have

a probability of moving between a set of mutually exclusive and collectively exhaustive Markov states. Markov models are particularly useful in modelling chronic diseases where there is a pattern of exacerbations or different stages where often a decision tree model would potentially end up with a large number of branches that would be difficult to check for errors. Figure 9 shows a simple Markov model with three states, and the transition probability in each cycle. Markov models typically start off with the whole population in one state. During each cycle for the 'well' state there is a 0.04 probability of moving to the 'unwell' state and a 0.01 probability of moving to the 'dead' state (the remaining 0.95 probability is for remaining in the 'well' state). In this case the 'dead' state would be called an absorbing state which means that people do not move back out of it once they are in it.

Figure 9. Example of a simple Markov model, showing transition probabilities.



In general Markov models are stochastic and have no memory, thus the probability of the next state is independent of the time spent in previous states, which can cause a logical problem. However there are adapted versions of Markov models that have tunnel states and other augmentations to better reflect reality. So for example a Markov model with a six month cycle may have a state of lung cancer and a probability of moving into a state of complete remission. If by definition someone cannot be in complete remission until they have not had any signs of cancer for five years then it would not make sense for someone to move to this state after six months, even though there may be an average probability of this happening over a longer period of time. So having a tunnel state whereby someone would

have to be in a lung cancer state for at least ten Markov cycles (5 years) before they could have a chance of moving into a state of complete remission would make the model more logical. But the need to make these augmentations depends on what question the model is answering, if the summed outcomes at the end are a good representation of reality then this may be enough even if the individual transitions do not make logical sense.

In terms of software, this work has used TreeAge, which is a piece of software dedicated to decision analysis and often used in economic evaluations (Menn & Holle, 2009). This thesis also used Microsoft Excel, which is a very widely used spreadsheet application, which when programmed using Visual Basic for Applications (VBA), can be used to model scenarios from data distributions to carry out sensitivity analyses or to simulate populations by drawing a large number of simulations from data distributions.

There are other methods which are used often in health economics. One method not used in this thesis is discrete event simulation (DES). This involves modelling at individual level and has greater possibilities than Markov or decision tree modeling, so it is particularly useful for creating virtual populations with sets of characteristics and multiple morbidities that would be difficult to represent in a Markov model, as the number of Markov states required will increase exponentially. However DES modelling is also very data hungry and can be difficult to interpret. The smoking cessation case study has used a cohort simulation model which is more similar to a Markov model than DES.

There is a checklist known as the 'Drummond checklist' which was produced for economic evaluation studies which is useful for assessing modeling studies (Box 1). Economic modeling should include sensitivity analysis, where the parameters in the model are varied to see how sensitive the model is to changes in these parameters. When assessing new technologies, NICE suggest that probabilistic sensitivity analysis (PSA) should be used. This is where model parameters are given a probability density function and a set of scenarios are drawn, so for example 10,000 scenarios may be drawn with parameters set to distributions, and likely cost effectiveness ratios calculated based on these scenarios. The distributions should be drawn from empirical studies or based on expert opinion. Any modelling studies should also justify the time horizon used, and the discount rate used for costs and benefits that occur in the future. Ideally a life time horizon should be used but it depends on the decision question. Often in economic evaluations costs and benefits that are not directly relevant to the disease area are excluded, so for instance with competing causes of death and intervention may prevent someone from dying from a smoking-related disease but they then have a chance of dying from dementia ten years later.

Box 1. Drummond checklist (Drummond & Jefferson 1996)

Referees' checklist (also to be used, implicitly, by authors)

Item	Yes	No	Not clear	Not appropriate
Study design				
(1) The research question is stated	☐	☐	☐	
(2) The economic importance of the research question is stated	☐	☐	☐	
(3) The viewpoint(s) of the analysis are clearly stated and justified	☐	☐	☐	
(4) The rationale for choosing the alternative programmes or interventions compared is stated	☐	☐	☐	
(5) The alternatives being compared are clearly described	☐	☐	☐	
(6) The form of economic evaluation used is stated	☐	☐	☐	
(7) The choice of form of economic evaluation is justified in relation to the questions addressed	☐	☐	☐	
Data collection				
(8) The source(s) of effectiveness estimates used are stated	☐	☐	☐	
(9) Details of the design and results of effectiveness study are given (if based on a single study)	☐	☐	☐	☐
(10) Details of the method of synthesis or meta-analysis of estimates are given (if based on an overview of a number of effectiveness studies)	☐	☐	☐	☐
(11) The primary outcome measure(s) for the economic evaluation are clearly stated	☐	☐	☐	
(12) Methods to value health states and other benefits are stated	☐	☐	☐	☐
(13) Details of the subjects from whom valuations were obtained are given	☐	☐	☐	☐
(14) Productivity changes (if included) are reported separately	☐	☐	☐	☐
(15) The relevance of productivity changes to the study question is discussed	☐	☐	☐	☐
(6) Quantities of resources are reported separately from their unit costs	☐	☐	☐	
(17) Methods for the estimation of quantities and unit costs are described	☐	☐	☐	
(18) Currency and price data are recorded	☐	☐	☐	
(19) Details of currency of price adjustments for inflation or currency conversion are given	☐	☐	☐	
(20) Details of any model used are given	☐	☐	☐	☐
(21) The choice of model used and the key parameters on which it is based are justified	☐	☐	☐	☐
Analysis and interpretation of results				
(22) Time horizon of costs and benefits is stated	☐	☐	☐	
(23) The discount rate(s) is stated	☐	☐	☐	☐
(24) The choice of rate(s) is justified	☐	☐	☐	☐
(25) An explanation is given if costs or benefits are not discounted	☐	☐	☐	☐
(26) Details of statistical tests and confidence intervals are given for stochastic data	☐	☐	☐	☐
(27) The approach to sensitivity analysis is given	☐	☐	☐	☐
(28) The choice of variables for sensitivity analysis is justified	☐	☐	☐	☐
(29) The ranges over which the variables are varied are stated	☐	☐	☐	☐
(30) Relevant alternatives are compared	☐	☐	☐	
(31) Incremental analysis is reported	☐	☐	☐	☐
(32) Major outcomes are presented in a disaggregated as well as aggregated form	☐	☐	☐	
(33) The answer to the study question is given	☐	☐	☐	
(34) Conclusions follow from the data reported	☐	☐	☐	
(35) Conclusions are accompanied by the appropriate caveats	☐	☐	☐	

3.6 Applying Health Economics to Public Health Interventions

Public health and health economics have one crucial thing in common; they both use a population approach rather than an individual approach. Measuring the cost effectiveness of public health interventions has some particular issues compared to measuring the cost effectiveness of more clinical interventions, which are:

- Willingness to pay is often low; it is hard to get market prices for costs and benefits when people are not used to paying for interventions (Hirth et al., 2000)
- Public health interventions often work via the mechanism of behaviour change which takes time, so often the behaviour is used as a proxy for the health outcomes, e.g. in smoking cessation when someone stops smoking this puts them on a pathway of eventually having a reduced risk of smoking-related diseases (Hardeman et al., 2002).
- Public health programmes are often complex, holistic interventions with multiple effects and can have competitive or synergistic effects with each other, and are often present within complex systems (Rychetnik et al., 2002).
- Multi sector effects – i.e. Teenage pregnancy interventions, drug treatment – benefits do not all fall to health system so are harder to measure – known as the cross sector flow problem. It can be difficult – but, it could be argued, not impossible- to measure these distant effects within current economic evaluation methods (Brazier & Tsuchiya, 2015).
- Effects of interventions are often measured at an individual level (although often aggregated and/or averaged out) while public health interventions may increase community cohesion or resilience which is not easily measured at an individual level. Also often reduce risk at a population level e.g. vaccinations (Diez-Rouz, 2000).
- Public health interventions often evolve or are applied differently across populations, so can be hard to evaluate or compare like with like (lack of fidelity). This is where programme theory and realist evaluation are useful (Rychetnik et al., 2002).
- Public health interventions often have a longer payback time than clinical interventions, for example creating a new green space, vaccinations etc. Because economic evaluations use discounting this can skew the effectiveness. This is why it is often recommended to use a range of discount rates in any sensitivity analysis, which is what has been done in this thesis for smoking.
- In general cost effectiveness analyses are meant to compare to the next best alternative but with public health it is not always known what an appropriate comparator is, and in practice analyses often use a 'do nothing' alternative.

- Public health interventions often target health inequalities, which can be at the expense of efficiency. So in terms of Marmot's principle of 'proportionate universalism' (Marmot, 2011) there is the question of how health economics should account for interventions with a differential impact on health inequalities, with some methods like distributional cost effectiveness analysis (DCEA) (Asaria et al., 2014) or a continuous social welfare function (Adler, 2012) being posited to essentially account for a more welfarist, egalitarian approach rather than the current extra-welfarist, utilitarian approaches. DCEA has promise; but one argument against it is that having a utilitarian 'QALY maximising' perspective should in general favour health inequalities anyway, as more deprived people lose more QALYs through ill health (Mooney, 1989). QALYs have not been explicitly weighted for deprivation in this thesis, rather it has considered the impact on inequalities as an additional outcome in the analysis through a health equity impact assessment. To apply proportionate universalism or indeed any of these approaches, a researcher would need to understand how health outcomes vary across socioeconomic groups, which is why it is important to monitor health inequalities.

3.7 NICE and Public Health

NICE (the National Institute for Health and Care Excellence) is an Executive Non-Departmental Public Body (ENDPB) of the Department of Health in the UK who apply health economic techniques to the appraisal of public health interventions. Since 2005 NICE have provided advice to local public health teams and to national policy makers on public health interventions. NICE was formed in 1999 by the Labour government and their main role was initially around clinical interventions, to provide advice to the NHS in what healthcare interventions should be provided, based on getting the best value for money and reducing the 'postcode lottery' where certain treatments were available in one area of the country but not in others. In 2005 NICE acquired this role in producing public health guidance in addition to clinical guidance from the Health Development Agency, producing their first public health guidance on smoking in 2006. The idea was to use evidence-based medicine techniques in public health guidance, therefore making guidance more robust and well respected. As of November 2011, they had produced 35 pieces of guidance on public health programmes or interventions. NICE's first edition of 'Methods for development of NICE public health guidance' was published in 2006 (NICE, 2006). A second edition followed in 2009 and a third in 2013. NICE now has one manual which has unified processes and covers all of the guidance they produce, including public health as well as clinical guidelines, social care, and medicines guidelines. NICE have taken on producing advice for local authorities and

producing social care advice. In November 2011 NICE was asked to develop briefings for local government to raise awareness of evidence-based public health interventions that Local Authorities could employ as they take responsibility for public health.

The economic methods that NICE utilise employ a mixture of cost perspectives, recognising that public health interventions have multi-sector effects (beyond health and social care). So for instance, an intervention to reduce unwanted teenage pregnancies can impact a number of systems, such as health, the benefits system and the education system. In measuring the benefit an intervention has for individuals, NICE has historically used cost per QALY (quality adjusted life year) gained (cost utility) as the gold standard (NICE, 2006). QALYs are based on a population level evaluation of the relative desirability of different health states. These health states are a simplified description of reality. In October 2011, NICE published a consultation document on changes to the methods and processes they use for public health guidance development. In recognition of the limitations around cost utility and what it measures, NICE are moving toward recommending that cost consequence analysis (where costs and consequences are listed separately without being rolled up into a summary measure like cost utility) also be routinely included, as well as cost benefit analysis (where the costs to the system, and a contingent valuation of benefits are both measured in terms of money). Cost consequence analysis is being recommended to capture how an intervention impacts on non-health benefits like participation, community cohesion, empowerment, crime and economic inclusion. Using cost benefit metrics like 'net present value' has already been adopted in some public health guidance, for instance NICE's guidance on preventing unintentional injuries on the road used established cost effectiveness methods for transport (NICE, 2010a). NICE have also changed their emphasis so that the guidance process does not differentiate between smaller public health interventions and larger public health programmes.

Cost benefit analysis is something that has been little used in assessing the value of public health interventions but is a method that if used successfully could have a lot of potential especially in environments such as in England where public health funding has moved from mostly being held in the National Health Service (NHS) to being in local government and other agencies like Public Health England (PHE). Because of these changes, being able to compare the value of public health interventions with programmes in other sectors using a common currency will become more important. Getting robust benchmarking data would be very useful for this as well.

Some of the guidance NICE has produced around public health has been controversial, for instance in January 2010 when they recommended bringing in minimum alcohol pricing for

England to reduced alcohol related diseases (NICE, 2010b), which led to some politicians saying that NICE had gone beyond their remit. However minimum alcohol pricing has subsequently been considered more seriously by politicians and the Scottish government are attempting to bring it in. In general it seems that NICE are felt to have overstepped the mark when they venture into the realm of policy rather than interventions and programmes (Gornall, 2014).

3.8 Case Studies of Public Health Cost Effectiveness

There has not been a huge number of cost effectiveness studies carried out of public health interventions. A rapid review of public health evaluations found that only 27% provided cost-effectiveness evidence (Matrix evidence, 2008). Several modelling studies have been commissioned by NICE to estimate the cost effectiveness of public health programmes and have combined outcomes and costs from different studies (Owen et al., 2012).

21 out of 26 NICE public health publications between 2006 and 2010 used cost-utility analysis (cost per QALY). These included interventions for smoking cessation, promoting physical activity, preventing STIs and unwanted conceptions in young people, reducing substance misuse in young people, promoting healthy eating, supporting people at risk of dying prematurely, promoting social and emotional wellbeing in primary and secondary schools, promoting mental wellbeing in older people, management of long term sickness and incapacity, wellbeing at work, alcohol use disorders, and CVD prevention. In a review of NICE Public Health Guidance, 200 cost-effectiveness estimates were analysed. Of these, 15% were cost saving (i.e. the intervention was more effective and cheaper than comparator), 85% were cost-effective at a threshold of £20,000 per QALY and 89% at the higher threshold of £30,000. 5.5% were above £30,000 and 5.5% of the interventions were dominated (i.e. the intervention was more costly and less effective than comparator). Most interventions had a very low cost per QALY, indicating they are highly cost-effective. Many interventions (particularly around smoking cessation) produced a net cost saving for the NHS. This study also acknowledges limitations in economic modelling of public health interventions such as lack of comparator, not considering synergy between interventions offered together, and not considering diminishing returns. NICE use economic modelling as part of their programme of work, but they do not explicitly recommend that local areas should use health economic techniques themselves. From working on a NICE Public Health Advisory Committee the researcher has seen first-hand that sometimes there are difficulties in generating evidence around the cost effectiveness of public health interventions, and

hopefully the techniques in this thesis will work towards demystifying economic evaluation a little.

Some notable cost effectiveness models looking at public health interventions include the HELP (Health England Leading Priorities) Tool, which ranked several public health interventions against a set of criteria (Matrix evidence, 2008). This used a multi-criteria decision analysis (MCDA) type approach to ranking interventions. The 5 criteria they used were;

a. Cost-effectiveness: Cost per Quality Adjusted Life Year (QALY) gained, including healthcare costs avoided.

b. The proportion of the population eligible for the intervention (reach).

c. The distribution of benefits: The ratio of the proportion of the most disadvantaged 20% of the population eligible for the intervention to the proportion of the population as a whole eligible for the intervention.

d. Affordability: The budget required to fund the intervention if all eligible people received the intervention.

e. Certainty: Confidence in the evaluation of the intervention, based on an assessment of the quality of the method and data used in the evaluation.

As will be demonstrated this is quite similar to the methods used to appraise the case studies in this thesis. Table 6 shows the rankings of the interventions. The top four are increasing alcohol and tobacco taxes, and having mass media campaigns around tobacco and obesity. Then the next three are brief interventions in GP surgeries. Many of these interventions have been commissioned in some form in England (Heath, 2014).

Table 6. Ranking of public health interventions from Health England Leading Prioritisation (HELP) Tool, 2009.

Category	Intervention	Priority Ranking	Priority Score	Affordability	Certainty
Alcohol	Increases in taxation to reduce population consumption of alcohol	1	11.30 %	★★★	★★☆
Smoking	Increases in taxation to reduce population smoking rates	2	9.62 %	★★★	★★★
Smoking	National mass media campaigns for reducing population smoking rates	3	9.46 %	★★★	★★★
Diet, physical activity, obesity	National mass media campaigns to reduce population levels of obesity	4	9.09 %	★★★	★★☆
Smoking	Brief interventions delivered in GP surgeries to improve quit rates	5	8.98 %	★★★	★★★
Alcohol	Brief interventions delivered in GP surgeries to reduce problem drinking	6	8.70 %	★★☆	★★☆
Diet, physical activity, obesity	Brief interventions delivered in GP surgeries to improve uptake of physical activity	7	8.63 %	★★☆	★★★
Smoking	Nicotine replacement therapy to improve quit rates	8	8.25 %	★★☆	★★★
STI / teenage pregnancy	Screening and treatment for reducing the prevalence of Chlamydia	9	7.38 %	★★★	★★☆
Diet, physical activity, obesity	School based group education to reduce population levels of obesity	10	7.25 %	★★★	★★☆
STI / teenage pregnancy	School based group education for increasing rates of condom use and reducing STIs and unwanted pregnancy	11	6.00 %	★★☆	★☆☆
Statins	Statins for primary prevention of stroke and heart disease (demonstrating QALYs for two example CVD risk groups)	12	4.26 %	★☆☆	★★☆
Mental health	Assessment and support of caregivers for preventing depression in caregivers	13	0.95 %	★☆☆	★★☆
Mental health	Screening and treatment to prevent depression in retirees (age over 65 years)	14	0.12 %	★★★	★★★

Tools have been developed for commissioners to estimate the return on investment for different public health interventions such as the NSMC Tools (Lister & Merritt, 2013) which looked at tobacco control, alcohol brief intervention, breastfeeding, weight management and bowel cancer screening. There is also the NICE Tobacco Control Return on Investment tool (Meads, 2014).

The Australian ACE (Assessing Cost Effectiveness) Prevention Study was a large scale review of the cost effectiveness of public health interventions. (Vos et al., 2010) This used cost per DALY saved as a primary outcome, but also had some second stage filters which were;

- Capacity of the intervention to reduce inequity;
- Acceptability to stakeholders;

- Feasibility of implementation; and
- Strength of the evidence base.
- Sustainability;
- Potential for other consequences (side effects).
- Cultural security;
- Community health gain.

This study was essentially combining aspects of cost utility analysis (with cost per DALY saved) and MCDA (with the second stage filters). The study found that a large impact on population health (i.e. >100,000 DALYs prevented per intervention) could be achieved by:

- Taxation of tobacco, alcohol and unhealthy foods;
- Mandatory limit on salt in 3 food items (bread, cereals and margarine);
- Improving the efficiency of blood pressure- and cholesterol-lowering drugs using cost-effective generic drugs (or potentially a low-cost polypill that combines three blood-pressure-lowering drugs and one cholesterol-lowering drug)
- Gastric banding for severe obesity; and
- Intensive SunSmart campaign.

The results of this study probably apply to the UK and are similar to interventions used or considered in the UK, with the possible exception of a SunSmart campaign; skin cancer ranks much higher as a cause of death in Australia than in England.

A report by the Equality Trust (2014), a group which was formed in the wake of "The Spirit Level" (Wilkinson & Pickett, 2010) used quite a simple methodology to put a cost on the healthy life expectancy (HLE) gap. This is similar to the researcher's work on putting a cost on the quality adjusted life expectancy gap (Collins, 2013a). The idea for this piece of work was that given that QALYs are the main outcome for health investment decisions, should there be there a potential for QALYs to be used more at a population level to determine the number of QALYs experienced in the population. This study combined survey data with life expectancy with data to calculate quality adjusted life expectancy (QALE). The theory behind this was that although quality adjusted life years are used in national decision making around investing in healthcare and public health, they are not a standard measure in assessing population health, despite potentially being more sensitive than life expectancy, or healthy life expectancy. QALE has the potential to be more sensitive because it is based on answers to a health related quality of life questionnaire which has more distinct health state possibilities; in this case the EQ-5D has 243 different health states and a range of corresponding utility scores from -0.59 (worst possible health) to +1.00 (best possible

health). This piece of work found that the most deprived areas of Wirral have a gap of 1,838 QALYs per year compared with the whole of Wirral. If this is valued at £30,000 per QALY, this equates to £55million per year. This lost potential for quality and quantity of life could be considered as a premium that society pays for allowing such social inequities that manifest themselves in health behaviours and outcomes, even from before birth.

Chapter 4. Theoretical Basis of Work

4.1 Objectives of Work

Primarily the objective of this work was to test the cost effectiveness of the services in question. This thesis has outlined the theoretical basis of health economics and cost effectiveness. On a second level it was testing an integration of methodologies, in working towards a way of accounting for the complexity of public health interventions within economic evaluations. This was using mixed qualitative and quantitative methods to test the theory of what worked, and at the same time to adjust the theory based on the contextual qualitative testimony. On a third level it was trying to work towards a pragmatic set of techniques that could be replicated by other researchers or evaluators in other areas. And on a fourth level it was thinking about the role of evaluation in informing future commissioning decisions, and informing future policy, at a higher level of decision making within Government. Evaluations are a way of informing the decision making process but are still often distinct from this process; the evaluation rarely makes the decision. Evaluations happen all the time, some are published in journals, while it could be argued that some only happen in a split second in someone's head when they make a decision. The case studies in this thesis are evaluations that have been written down. If these evaluations were not carried out, decisions would still need to be made and it may be that the same decisions would have been made, or it may be that the recommendations from these evaluations have not been particularly influential in the decision process anyway.

4.2 What do we mean by 'Evaluation'?

WHO (1998) define evaluation as "the systematic examination and assessment of the features of an initiative and its effects, in order to produce information that can be used by those who have an interest in its improvement or effectiveness." This is different from audit which uses routine data, usually measures against defined standards, and never involves disturbance to patients or clients beyond normal clinical management. Evaluation is different from research which usually measures against a hypothesis, often has randomisation, is often testing out a novel intervention, and is most often for an academic standard. Evaluation is nearly always done retrospectively, though some analysts call prospective or theoretical models evaluation as well. Evaluation appeals because it seems to be most relevant to the on-going commissioning decision making process which is approached in terms of working pragmatically backwards from the decision that needs to be made, determining the questions that need to be answered, and then getting the information needed to answer

these questions. One of the key questions for any evaluation is how many outcomes to measure. Sometimes it makes more sense to use fewer measures even if they are only crude proxies for success. There are lots of taxonomies for evaluation. Because this work is mostly concerned with evaluating public health projects, some are less relevant than others.

Evaluation is often described as summative - measuring whether outcomes were achieved, or formative - looking at the process of how a policy, programme or intervention was implemented. Often evaluations include both elements. Evaluation, like research, mainly uses three sets of methods; qualitative (collecting narrative accounts), quantitative (collecting data), and mixed methods (using both narratives and data). Generally, qualitative methods are used in inductive research, while quantitative methods are used in deductive research. Inductive research is about generating theories from observations, and deductive research is about testing theories with observations. Qualitative methods may include grounded theory, semi- or unstructured interviews, or focus groups. Quantitative methods include comparing before and after data using t tests, using regression, factor and cluster analysis to disaggregate the relationships between variables, and many other methods.

There are examples of cases where mixed methods can be useful. In a qualitative study, having some quantitative information can be useful as context, so in a study about lung cancers caused by radon some context about how many people are affected by radon may add some background before having a 'deep dive' into generating qualitative themes about why people do something about radon in their homes. Or alternatively, adding some qualitative observations can be useful for adding some explanation to quantitative data that may not immediately be apparent in the data analysis. Mixed methods research allows researchers to be pragmatic about how they use information, so looking inside an organisation a researcher may get access to some data and may be able to have some focus groups or interviews to generate qualitative research. It may be that this information is piecemeal and combining it in the best way to form a coherent narrative involves a mixed methods approach.

For public health and health promotion there has been a debate; with some commentators arguing that an increased use of evidence based medicine type methods like RCTs is required to get a stronger evidence base (Glasgow et al., 2003), while others have stated that these methods put too much emphasis on individual-level outcomes for what are often complex, community level programmes and thus that a broader set of methods, including process evaluation, should be used (Speller et al., 1997). Commentators have suggested that too often, macro-level interventions such as condom distribution may be evaluated using micro-level outcomes such as individual risk of HIV rather than macro-level outcomes like

the impact on the whole of society. Cluster or group-randomised trials partly get around this problem of accounting for synergies or competition in community level interventions (Smith & Petticrew, 2010). Realist evaluation is a mixed methods approach which accounts for a lot of the complexity inherent in public health programmes and trying to maximise both internal validity and external validity while working on the principle that real life programmes can only ever be partially understood. We will go on to explain realist evaluation in more detail in Section 4.5.

The interventions in the case studies in this thesis are mainly delivered on an individual basis and thus may lend themselves to RCTs as long as these RCTs took proper account of the level of complexity inherent in the intervention and included the impact on wider societal outcomes such as fear of crime, or passive smoking. The main recent UK studies of drug treatment have not been RCTs (Godfrey et al., 2004; Davies et al, 2009), rather they have been before and after studies, and this is because it would not be felt to be ethical to withhold treatment from a problematic drug user who was motivated to attend treatment. The biggest recent UK study of alcohol treatment was an RCT which compared two different types of alcohol treatment, thus removing the potential ethical problem of withholding treatment from one group (UKATT Research Team, 2005). There have been several recent RCTs of smoking interventions, in particular of varenicline (Champix) which is still a relatively new drug with a higher prescription cost than other pharmacological agents for smoking cessation (Jorenby et al., 2006).

Economic modelling techniques often combine data from epidemiological studies or RCTs but they do not always use the same threshold for quality of evidence and can include expert opinion as an input. A good model needs to be explicit about its limitations and there are several checklists that economic models can be evaluated against (Husereau et al., 2013). Social return on investment is another quasi-economic mixed methods approach that uses individual valuation methods to determine the value that stakeholders put on outcomes which are then quantified.

Evaluation could be seen to be measuring whether a service has been implemented correctly or whether it has produced the outcomes that commissioners intended it to. There is an opportunity to move evaluation further by introducing some of the same economic modelling techniques that are used by policy makers at a national level at a local level, albeit mainly only using data from before and after comparisons rather than comparing against control groups, which may produce a higher level of rigour within the evidence based policy paradigm. Within the case studies in this thesis, the data and the modelling deal with the relationship between inputs and outcomes while the narrative mainly deals with the

complexity, although there are context-mechanism-outcomes tables as well which attempt to work towards a programme theory explaining what combinations of contexts, psychological mechanisms and outcomes are triggered by the programmes. So roughly speaking, this uses elements of cost effectiveness/cost utility analysis and equity impact analysis for the outcomes, and realist evaluation for accounting for the process evaluation, complexity and generalisability. Some researchers have argued that economic evaluations should take into account 'procedural utility'; the utility derived from the process as well as the utility derived from outcomes (Jan, 2014). This thesis has not included this but there may be potential to do this in the future.

Economic models can be time consuming to develop, particularly having the evidence to inform the parameters that drive the models. The intention with the economic models in this thesis was to create effective models that could be used for several years, so for instance the smoking analysis in the case study is from a model that is an extension of a model built two years earlier prior for which more recent data is applied. This is appropriate as the epidemiological evidence for health outcomes associated with addictive behaviours is unlikely to change in that amount of time. This is moving economic evaluation closer to SROI in that the analysis will be repeated over a period of time.

4.3 Policy & Implementation

Understanding policy and implementation, the theories of how policy is made and how to analyse policy is important for realist evaluation. This is because public health programmes exist in the context and the history of the policies that created and maintained them and they have long chains of implementation where changes happen.

There are two main models of policy; rational and incremental. The rational model was popularised by Simon (1979) and involves defining a problem, assessing options, picking an optimal solution and implementation; often very much a top down process. The rational model may be good in theory but works less well in practice where the options and their consequences are often complex and not well understood. The incremental model involves starting with policies as they are, not with a blank sheet, always adapting, making it deliberate and trying to learn – still quite top down but recognising that you cannot start from zero. While the rational model involves trying to make the best choice, the incremental model involves 'muddling through' and valuing the policy with greatest consensus rather than the scientific 'best' policy (Lindrom and Woodhouse, 1993). Incremental policy is the actual experience of making policy where there is a complex array of existing investments in staff, professionals, estate, technologies and equipment that need to be taken into account.

Incremental policy recognises the fact of 'bounded rationality'; that a decision maker's rationalism exists within a context of their own knowledge, beliefs and the amount of time they have to make a decision (Kahneman, 2003). A decision can never be objectively rational because no one will ever have access to perfect information.

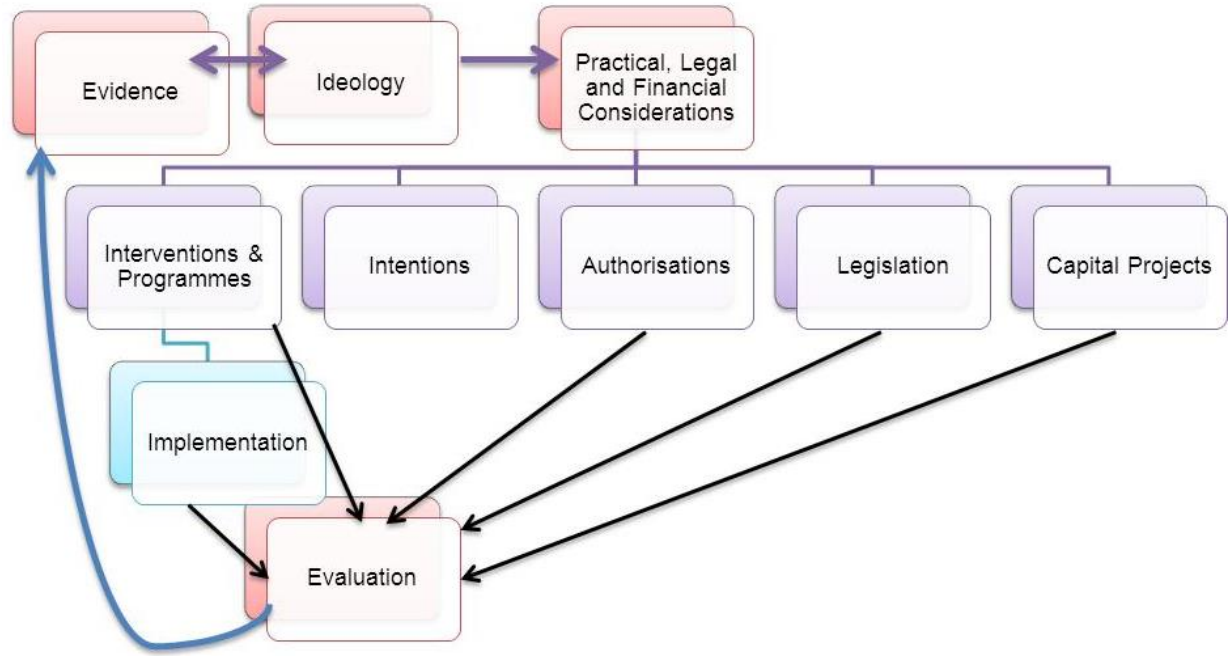
Linked to rational policy making is evidence-based policy, which has its roots in evidence based medicine. Evidence based medicine is often based on analysing individual level data where it is easier to isolate the effect of an intervention, whereas in policy interventions the results are often at a community rather than individual level and are more complex and context-specific. But while medical practice is often tightly controlled outside of well-designed trials, there is actually more opportunity to have natural experiments in social policy programmes, and indeed in public health. Whether rightly or wrongly, social policy and public health is seen as less 'life and death' and there is less threat of litigation if someone does not get optimal treatment. Politicians are often criticised for picking and choosing what evidence they consider (Giles, 2006), and use of rational evidence based approaches like randomised trials or stepped roll out of policy measures is rare. In terms of ignoring evidence, the Government sacked the chair of the Advisory Council on the Misuse of Drugs, Professor David Nutt, over a series of disagreements over policy and the risks associated with different drugs (Humphreys & Piot, 2012). The UK government launched a 'What Works' initiative in March 2013 which worked towards having six evidence centres to provide high quality, independently assessed evidence for policy makers to use. This is using evidence-based policy methods. The idea behind this came partly from seeing how NICE was valued as an evidence centre and a source of knowledge transfer for health policy and decisions. This has to be seen as a positive step, although it remains to be seen how much these centres actually influence policy, and to what extent the centres are free from political influence.

The UK's model of policy is based on representative rather than participatory democracy and mainly a political 'winner takes all' system which means that politicians often have quite a prominent role in policy and have an executive role over the civil servants who implement policy (Richards, 2008). It may be that politicians set the policies and civil servants design the programmes to achieve them but in practice politicians will have a lot of input into large programmes as well.

Just as realist evaluation says that programmes are theories brought to life, likewise it can be said that many programmes are policies brought to life. Understanding how policies work involves understanding behaviour and how organisations relate to each other. Also because most cost effectiveness analyses involve an assessment of the cost of a behaviour, to society, or to the health system, this is useful in informing the potential savings that can

result from successful policy, so for instance if it is estimated that the net cost to society of binge drinking is £1billion then a policy intervention to reduce or eradicate binge drinking has the potential to produce this cost saving (although you would need to consider deadweight, money reallocated and many other knock-on effects). Policies are often based on political ideologies that have been filtered through a lens of pragmatism; taking into account factors like feasibility, the availability of plant and workforce, public opinion, economics and timing (including the electoral cycle). If an intervention works then it might trump the ideology, so for example because harm reduction in drug users works, it trumps the Conservative ideology of not wanting to condone any drug using behaviour, and becomes 'bottom up' policy making (Ashton & Seymour, 2010). A policy may be a political desire, such as an increase in the proportion if the population who are self-employed, which can be achieved through a mixture of authorisations, instruments and programmes. So the desire is for fewer people to use drugs and for drug addicts to be in treatment which can be achieved by making more drugs illegal (a piece of legislation which is an instrument), giving police increased powers to search the homes of suspected drug dealers (an authorisation), and having drug treatment (a programme) within which there is opiate substitution (an intervention). There may also be large scale capital projects (which could also be facilitated by legislation or could be called programmes) such as building a large prison or rehabilitation unit.

Figure 10. How policy and evaluation interact as part of the decision making process.



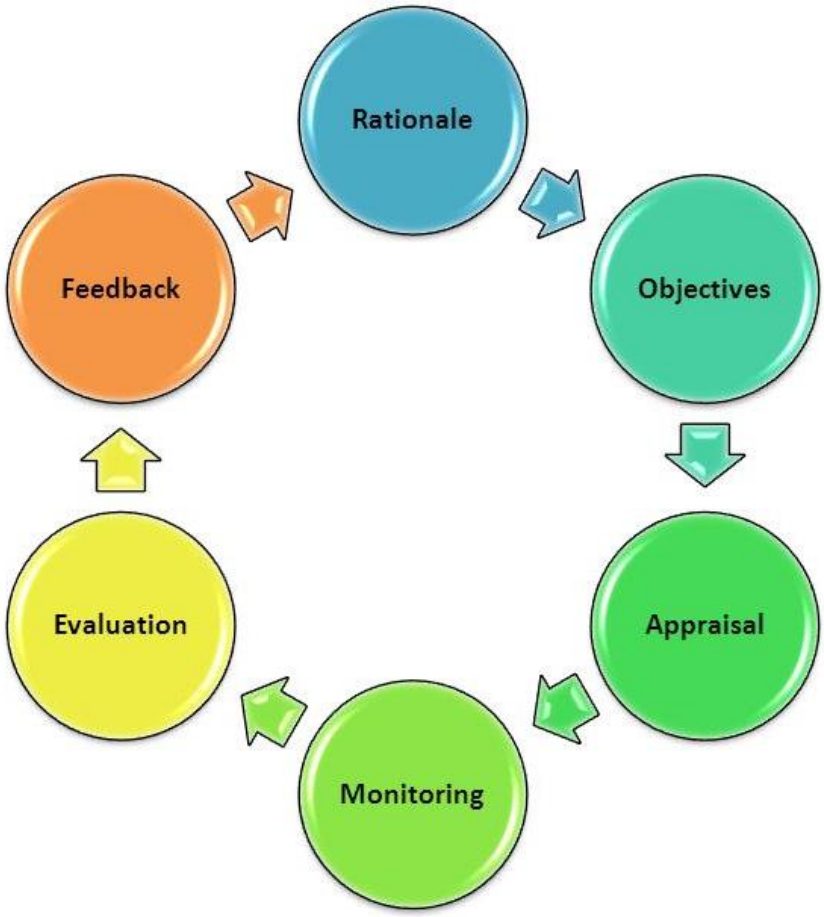
Another policy implication in this thesis is in the policy around evaluation. The UK Treasury's Magenta Book (2011) gives a set of techniques for policy evaluation but is not overly prescriptive; it does not explicitly identify 'brands' of evaluation. The Magenta book locates evaluation in the ROAMEF cycle which is similar to an ideal, rational model of policy, rather than a more practical, incremental form of policy.

The Magenta Book splits policy evaluation into three broad categories;

- Process evaluation – answering the question, how was the policy delivered? – This ties in with implementation research.
- Impact evaluation – answering the question, what difference did the policy make?
- Economic evaluation – answering the question, did the benefits justify the costs?

These are similar to some of the methods used to evaluate interventions, which is not a surprise given that some ‘policies’ are essentially ‘interventions’.

Figure 11. The ROAMEF Cycle.



From HM Treasury (2011).

Economic evaluation techniques are seldom used in public health practice and are often the realm only of organisations like NICE or involve bringing in outside consultancy expertise. Tools that like the NSMC's 'Behaviour Change Value for Money Tools' (Lister & Merritt, 2013) and Public Health England's 'Weight Management Economic Assessment Tool' (Dinsdale et al., 2014) have helped to bridge the gap between academics and economists on one side, and practitioners and commissioners on the other side. NICE have also produced costing tools around some of their public health guidance, and have produced a Tobacco Control Return on Investment tool (Pohkrel et al., 2014). These types of tools can be used more by commissioners, for example if they are deciding to commission a Payment by Results (PbR) rather than a block contract service.

We have discussed differences in how policy is formulated, whether rational or incremental, but related to this are differences in how policy is applied. This is implementation. The literature around implementation really became influential in the 1970s as commentators such as Pressman & Wildavsky (1973) became dissatisfied with how public services were delivered and how many policy initiatives were not effective. Hogwood and Gunn (1984) set out ten preconditions for 'perfect implementation' which have become very influential over the years. These come from the assumption that the rational, top down approach to implementation is the correct one. They also seem to work best for policies that involve one organisation and do not require external negotiation, whereas many public health policies involve an acceptance of negotiation with external parties, and strong dependency relationships.

1. External constraints - "The circumstances external to the implementing agency do not impose crippling constraints"

2. Adequate time and resources - "That adequate time and sufficient resources are made available to the programme"

3. Required combination of resources - "That the required combination of resources is actually available"

4. Policy based on valid theory - "That the policy to be implemented is based upon a valid theory of cause and effect"

5. Clear cause and effect relationship - "That the relationship between cause and effect is direct and that there are few if any, intervening links"

6. Minimal dependency relationships - "That dependency relationships are minimal"

7. Agreement of objectives - "That there is understanding of, and agreement on, objectives"

8. Sequencing of events - "That tasks are fully specified in correct sequence"

9. Communication and coordination - "That there is perfect communication and co-ordination"

10. Total compliance - “That those in authority can demand and obtain perfect compliance” (Hogwood & Gunn, 1984 p. 199-206)

Buse and colleagues (2005) state three different approaches of how policies are implemented; top down, bottom up, and principal-agent. Top down means that policy objectives often come from a senior level (‘command and control’, and often based on rational evidence), from civil servants and politicians and are then sent down for practitioners to decide out the detail while attempting to be faithful to the vision of the policy makers. In the top down approach, once the policy is decided, implementation is not about changing the objective but about incentivising and maintaining the activities needed down the chain of command, which may involve an amount of ‘satisficing’ or an incremental approach. There is an implementation ‘gap’ which is the difference between policy maker expectations and the actual outcomes (Marsh and Rhodes, 1992). There are always gaps in policies where individuals are able to have a degree of autonomy. With public health policy, it can be argued that practitioners have a lot of discretion compared to surgeons or market inspectors. This means that there is more opportunity for them to bend the rules or be more innovative with how they apply policy. Bottom up approaches to implementation mean that policy objectives are decided with practitioners, and are subject to more differences in interpretation, but there is the question of whether these ‘street level bureaucrats’ making changes in implementation are then unaccountable in the political process. The principal-agent approach means that there is a clear relationship between principals (who set out policies) and agents (who implement policies) where agents are given an amount of freedom depending on the complexity and context of the policy being enacted. Hill (1997) suggests that in many cases policy tensions are left to be resolved in the implementation stage because it is better to make decisions first and figure out the practicalities later, or because implementers are better equipped to make key decisions that may involve complex negotiations and require a stronger knowledge of the facts than policy makers have. Over the past ten years there has been an expanding literature around implementation in public health and how public health programmes need to be implemented differently in different contexts. Public health interventions are more context dependent than clinical health interventions because they involve catering for populations with different cultural, social, economic and religious experiences. This may mean a greater opportunity for bottom up approaches where people have specific skills or can innovate in communities.

It could be argued that one role of local public sector commissioners and managers, as well as specifying how a service should be delivered, recruiting and managing staff, managing finances and monitoring and evaluation, is deciding how a service should be implemented. Most public sector commissioners are commissioning services that are variations on a

theme, many of which are guided by national policy and guidance documents. So the job of managers is to decide, within the time, resource and political constraints they have, how a service should be implemented locally. This may involve a focus on certain elements of a service that are judged to be most successful or cost effective. There can be a distinction made between implementation differences that are decided at a service level, and those small changes in emphasis that individual workers make to strike up a rapport or to tailor their approach for clients who are motivated by different things, so for example a drugs case worker may use different approaches with drug users who are from a more deprived background, than with more educated drug users who might have a stable, well-paying job or for drug users with different levels of education or different interests. But these individual changes in emphasis should also inform the overall approach to implementation.

The challenge of local managers is to implement programmes without losing the crucial elements that make a programme work at the same time as adapting programmes to local contexts. Hogwood & Gunn (1984) call losing the crucial elements 'non-implementation' while making local changes that adapt programmes but are not successful is 'unsuccessful implementation'. The challenge of evaluators or researchers is to try to tease out where an intervention does not work because the theory behind it is inherently faulty, or where an intervention does not work because it has not been implemented with enough attention to being faithful to the original theory (Rychetnik et al., 2002). There is also possibly more of a challenge for policy makers and guidance bodies like NICE to be clear in setting out what are the crucial elements of a service and which elements are amenable to local interpretation.

We will move on to explain how realist evaluation is one technique for understanding how services are implemented. By understanding the context in which services are delivered, and the mechanisms through which a service delivers outcomes, realist evaluation can describe how a service has been, and how it should be implemented. Sometimes implementation means that not only the elements of a service change but also the objectives. Process evaluation and theories of change are other methods that can be used for this type of evaluation. The case studies in this thesis will make reference to how services have been implemented to take account of the local social, political and financial contexts.

4.4 The Evaluation Problem – Dealing with Complexity - Realist Evaluation

Economic evaluation nearly always takes a normative rather than positivist perspective and the analysis in this thesis is no exception. As is the case with much cost effectiveness analysis in healthcare, this thesis aims to answer the question, is service X a good use of

resources; it does not aim to answer whether service X is the best use of resources, or whether it is a good idea in the first place. Someone with a politically libertarian point of view may think that these services should not be provided in the first place. There is also a difference between a service being cost effective and a service being maximally efficient. This thesis compares services against the NICE cost per QALY threshold which is used in health and social care decision making in England and Wales, which is typically an ICER (incremental cost effectiveness ratio) of £20,000 - £30,000 per QALY gained (Rawlins et al., 2010). The services considered in this thesis are for treatment of addictions, some of which involve substitution therapies such as methadone for opiate addiction and NRT for tobacco dependence, and it could be argued that without these services more people may die, but also more people may become dependence-free on their own, or through self-help or independent sector groups that are not directly funded by the state, such as Alcoholics Anonymous (AA), so it is an important question to try to establish whether these services are efficient as well as effective.

Methods like 'theories of change', logic modelling or driver diagrams may be useful in accounting for complexity and seeking to explain relationships between services (Ogilvie et al., 2011). These methods are used more in strategic and management grey literature than in academic literature. Logic models have been recommended by many research funders, for instance by the US Centre for Disease Control as part of a family of techniques for programme evaluation in public health (Koplan et al., 1999). Logic models describe the components of a programme as well as the sequence of events and resources needed to bring about a change. Logic models can be used to foster a shared understanding of services and outcomes so that partners can focus their energy efficiently. Logic models can be a way of combining qualitative and quantitative data in a mixed methods approach to understanding the impact of public health interventions (Baxter et al., 2010). 'Theories of change' is a different technique to logic modelling in that it emphasises the importance of context more and can be less linear (Blamey & Mackenzie, 2007). 'Theories of change' can be used to describe steps to achieve an outcome, whereas logic models are most often used to describe an actual programme or intervention. A well thought out logic model may look quite similar to a 'theories of change' model (Funnell & Rogers, 2011).

Economics as a discipline is trying to answer 'why' questions; understanding why things happen. But a criticism of economic modelling and cost effectiveness as methods of evaluation is that they ignore context. To take account of this in these case studies, local data has been used wherever possible to parameterise the economic modelling. As part of the set of techniques used to evaluate services, this thesis includes elements from realist

evaluation. This is mainly based on Pawson (2013) and has its roots in Bhakshar's critical realism which builds on the epistemology of scientific realism. Bhakshar (1979) talks about the realm of the observable (sometimes called the empirical), the actual and the real. The *observable* is what can be observed through the senses, while the *actual* may be hidden in an immediate sense but a researcher can get to it. The *real* is where the epistemology of scientific realism differs from positivism and subjectivism; the real may not be observable or actual but it may comprise the latent power structures or contexts that determine the actual. The real is the underlying explanatory factors that cause changes in outcomes in the realm of the actual and is the area that critical realism is most interested in describing. Some commentators have said that critical realism should not consider only what the causes are of phenomena, but also lead to what the situation should be, so they are moving towards a moral or ethical judgment (Cruickshank, 2003).

Ray Pawson is one the main theorists in the field of realist evaluation and is responsible for the set of techniques that are combined with economic evaluation techniques in this thesis. Ray Pawson and Nick Tilley's realist evaluation methods have their roots in looking at criminal justice interventions but have been applied to public health. Pawson (2013) states that researchers need to forget about tribalism in evaluation. Historically there has been a split between people who believe in positivist, summative, mainly quantitative, experimental evaluation and formative and process evaluation that was more phenomenological and qualitative. Pawson argues that any robust evaluation needs to utilise people with a variety of expertise and have a mixed methods approach. Realist methods aim to account for the complexity inherent in social programmes that may explain why some programmes may show promise in pilots but do not work when they are rolled out (Pawson, 2002). Realist methods recognise that reality is emergent, it does not stand still.

Realist evaluation is part of the family of theory-driven evaluation methods. People in theory-driven evaluation may slightly pejoratively call alternative methods 'black box' evaluation methods (e.g. Chen & Rossi, 1983), implying that in these studies evaluators only care about the inputs and outcomes not about how something works. However in reality most medical and public health evaluations include at least some cursory explanation of the mechanism. This phenomenon of the lack of explanations of mechanisms may be partly due to the structure and brevity required for papers in medical journals. In realist evaluation, programmes are said to be theories embodied. Programmes are lot of things to different people; so to an economist a programme might be a list of costs and benefits, to a smoker it might be a way for them to try to stop smoking, or to a practitioner they are a rewarding job and a salary. Realist evaluation should articulate the programme methods; it should aim to

understand what worked for people. The programme mechanism captures the idea that people make programmes work; if a programme does not work it may be because the programme theory is not being applied correctly or because it does not work in a given context. The mechanism in realist evaluation is described as being a change in the reasoning or the resources available to somebody, and cannot always be observed. Realist evaluation is useful for describing things like power or status that may be latent and cannot always be observed directly. Realist evaluation believes that programmes are unique but programme theories are rarely unique and are often transferable and crop up over and over again. Pawson (2013) argues that referring to programmes as treatments disembodies them and forgets about the context. Perhaps this is just getting lost in a debate about terminology and nomenclature.

In 'Personalising Evaluation' Kushner (2000) talks about the importance of taking into account the personal perspective, as focusing too much on the programme loses the context and loses the fact that the programme might actually be quite a small part of someone's life. So for example, somebody who has decided to quit smoking may use NHS smoking cessation services but they might have lots of other things going on their lives (like family pressures, work, illness) which could have a greater effect on whether or not they successfully quit. Personalised evaluation is about being sensible and proportionate about the programme's contribution to the outcome. It is not about over-generalising from a small number of pen portraits or case studies; rather it is seeing things through a different lens.

Pawson (2013) questioned the validity of the traditional randomised controlled trial (RCT) way of evaluating changes in healthcare programmes, which he called the OXO paradigm: observe a system (O), introduce a change (X), in some participants but not others, then observe again (O). Instead realist evaluation is looking at a CMO paradigm – context, mechanism, and outcome. This has some similarities with methods such as 'theories of change', impact modelling, or driver diagrams (Funnell & Rogers, 2011). Realist evaluation criticises other methods like logic models for assuming a linear relationship or linear chain of events between inputs and outcomes when the real relationships are more complex and recursive. Realist evaluators argue that it is about a change from merely making judgments on the success of a service - 'a thumbs up or thumbs down' to making explanations – understanding why does a service work for some people but not others. This includes whether there is uptake for a service in the first place. Realist evaluation argues that in RCTs it is not necessary to understand how a programme worked while they are interested in multiple outcomes or patterned outcomes. Realist evaluation aims to answer the question, "What works for whom, in what circumstances, in what respects, and over what duration?",

or in more recent years, “What works, how, why, for whom, to what extent and in what circumstances, in what respect and over what duration?” (Wong et al., 2013). Realist evaluations most often use comparative (usually quantitative) evidence to understand the impact of context, and use qualitative evidence to explain the complexity and the mechanism. Pawson claims that empiricists struggle most with the parts of realist evaluation that are most qualitative, for example, emergence (below). Pawson believes that social systems are ordered but can be infinitely complex, but that theory driven inquiry is needed to start to make sense of complex systems, even if it only ever generates partial knowledge at best. There seems to be analogues between CMO configurations in realist evaluation and axial coding in Straussian grounded theory (a method of analysing qualitative data) which talks about context, action/ interactional strategies and consequences of those strategies (Strauss & Corbin, 1998).

One key term in realist evaluation is complexity. Instead of concentrating on how generalizable a programme is, realist evaluation is about embracing complexity and trying to explain it as much as possible. The main elements of complexity are summarised with the acronym “VICTORE” which stands for;

[Parts of this are cited verbatim from Pawson (2013)]

- **Volitions**: The “choice architecture” of a program including how program subjects might respond to a program or intervention; it can take time to change people’s minds, to move them from being an outsider to being an insider in terms of the programme.
- **Implementation**: The implementation chains of an intervention/program which “are prone to inconsistency and interpretation, blockages, delays, and unintended consequences” (p.36); often involve very long chains for example from the Department of Health to the person at the front line. People in the chain are trying to improve as they go along. Implementation maps may look at flows of resources and chains of responsibility as well as the ‘theories of change’ behind every stage, strategy and tactic.
- **Contexts**: The context of an intervention refers to the circumstance in which it plays out. Contexts vary from the micro to the macro. Pawson outlines a “four I’s” framework: *Individuals* (characteristic and capacities of stakeholders in the program); *Interpersonal relations*; *Institutional settings*; and *Infrastructure* (which refers to the wider social, economic, and cultural setting of a program/intervention);
- **Time**: Map the history of the family of programmes of which the intervention under study is a member. Temporal mapping may include the experiences and success

and failure of similar interventions. There is often a 'showcasing effect' where new interventions work because they have impetus, people are excited about them; 10 years later they have become "part of the furniture".

- **Outcomes**: Map the approaches for monitoring and ways stakeholders might interpret the outcomes; and whether behavior may change as a result of extra monitoring as well as through the primary intervention.
- **Rivalry**: The pre-existing policy landscape in which the program is embedded – this primarily refers to "other, contiguous programs and policies may share or oppose the ambitions of the intervention under study and actions of stakeholders and subjects under study". Policy is made up of programmes, so it is difficult to measure a single "unwashed" action of a programme; some programmes are rivals.
- **Emergence:** Potential emergent effects, long-term adaptations, societal change, and unintended consequences associated with the programme/intervention. Programmes change the conditions that make them work, e.g. CCTV was first used in terms of town centre disruption. Later on young people started having mock fights in front of cameras. CCTV started off as the programme; now it is the context. Consider how the programme will maintain a balance between recruitment, retention and exit.

It is acknowledged that it is hard to account for all of this but researchers can only keep trying, keep going deeper in to trying to understand the real mechanisms and adding more levels of detail and caveats. It is suggested that any piece of evaluation should start with an initial mapping of these elements of complexity. There is also realist review and realist synthesis, which realist evaluation should include in terms of accounting for the history, context and previous evaluation literature (Pawson et al., 2005).

There is a debate in evaluation about whether the evaluator should sit outside programme or sit inside to improve it. Practitioners are good at delivering theories about whom a service would work for. Instead of trying really hard to minimise bias (such as by using double or triple blind analysis and not involving practitioners in evaluation), realist evaluation aims to include the wisdom of practitioners in the study, and make any prior potential biases explicit.

Commentators such as Ben Goldacre have called for more trials in the social sciences (Haynes et al., 2012), but the level of complexity and the impossibility of generating a well matched comparator for social interventions has been used as a reason (or maybe an excuse) to not do randomised controlled trials (RCTs). However often in the absence of these kind of trials, nothing concrete has been used instead and evaluations have had little justification for the choice of methods used and have had a strong confirmation bias. In the UK the Government has established a network of 'What Works' evidence centres to bridge

the gap between evidence and policy. There have been some examples of realist RCTs as well (e.g. Waterlander et al., 2013), but there is a debate over whether RCTs and realism can work together.

The MRC's guidance for evaluating complex interventions (see Craig et al., 2008) recommends assessing the fidelity of programmes and using methods like stepped wedge randomisation where withholding programmes is difficult to justify. Pawson says that randomisation has become a fetish. Moreover he says that using language like ‘fidelity’ and ‘confounds’ is missing the point of how programme implementation evolves. He states that this language regards this evolution as something unwanted, a negative, something to be controlled for in trial design rather than a natural and positive part of the process that needs to be accounted for in the evaluation.

There has been calls to use realist RCTs for complex public health interventions (Bonell et al., 2012) but this has been rejected by some of the main proponents of realist evaluation, mainly because they say the ontological and epistemological philosophies behind realist evaluation are incompatible with the positivist ontological assumptions behind RCTs (Marchal et al., 2013). RCTs typically assume relationships between independent and dependent variables are stable and exist in equilibrium, while realism states that although there can be some explanation, causal mechanisms for complex social outcomes cannot be described in this way as being stable or having this external validity. This difference in philosophy would of course also be the case with economic modelling although economic modelling does not make all of the same assumptions as RCTs.

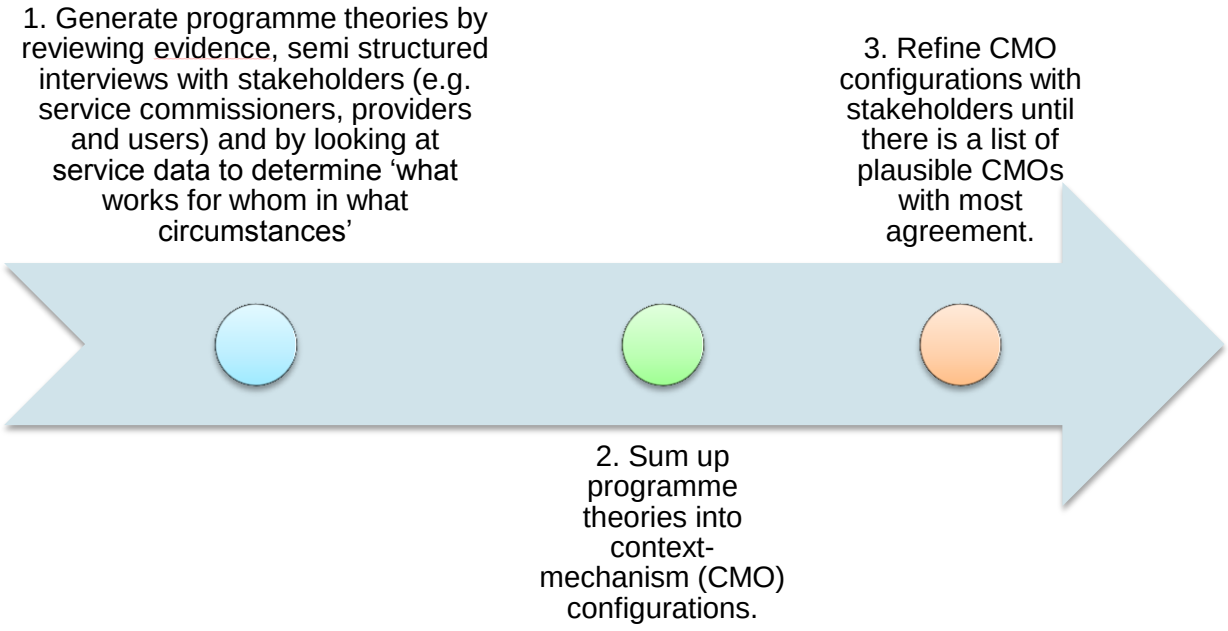
A paper by Shiell and colleagues (2008) emphasised the need to differentiate between complex interventions and interventions which were implemented in complex systems. So for example a hospital is a complex system where an intervention to reduce A&E attendances may have implications somewhere else in the system. Many public health interventions are complex, as they work at a population level, where we are working with 'free range' not 'battery hens'. There are often several components to an intervention, as well as several outcomes, and externalities. This level of complexity is especially true in addiction treatments as they often combine pharmacological with psychosocial interventions; it may be known that combining in this way is more successful than using one technique on its own, but the mechanism of the interaction between the two is not always well understood. So for instance for smoking cessation, the evidence is that dual NRT or Champix combined with counselling is the most successful intervention (West & Owen, 2012), or for heroin addiction, combining opiate substitution with psychosocial interventions is regarded as the most successful intervention.

There have been calls to use realist methods more in economics. In "Economics and Reality" (2006) Tony Lawson outlines how the field of economics needs to update its methods to deal with real world problems, and think about economic problems in terms of their mechanisms in the tradition of critical realism. Lawson believes that economics as a discipline is over-reliant on modelling techniques that neglect the influence of context and do not account for complexity. When models fail to predict accurate results, economists still do not always realise that it may be because they have failed to take contextual factors into account.

4.5 The Realist Evaluation Process

In this thesis, the realist evaluation methods involved include talking to stakeholders in the form of service users, service providers, managers and commissioners. This was carried out using semi structured interviews that were synthesised by the researcher into the text and into the CMO tables. The questions used are shown in Appendix 2. The interviews asked similar questions around drug, alcohol and smoking specialist treatment although most of the interviews were with drug treatment staff. Realist evaluation also involves trawling existing evidence and policy documents for mechanisms and making comparisons within the service data to see who the service works best for. This process is summarised in Figure 12.

Figure 12. Realist Evaluation Process.



4.6 Summary – Introductory Chapters

Chapter 1 introduced the geographical location for the case studies and emphasised why the history and health inequalities existing within Wirral make it an ideal place to undertake the analyses presented in the remainder of this thesis. Chapter 2 summarised the history of public health and addiction and Chapter 3 and 4 introduced health economics, the main theories of evaluation and emphasised how evaluation is crucial in underpinning evidence-based policymaking. These chapters have introduced the main techniques used to evaluate public health programmes, namely, economic evaluation, realist evaluation and health equity impact assessment. The next three chapters provide the case studies which form the empirical heart of this thesis as they illustrate the practical application of the mixed methods approach applied to public health evaluation in this thesis. The methods employed evolved as the research developed and met with a mixed degree of success which will be examined in each case study. Each case study took a slightly different approach based on the availability of data and the number of semi structured interviews that could be carried out to produce qualitative evidence on the service.

The primary aim was to assess the cost effectiveness of each of the interventions analysed with the main outcome measure utilised being the cost per Quality Adjusted Life Year or the Incremental Cost Effectiveness Ratio. In the case of the realist evaluation the primary aim was to enhance our understanding of the CMO (context-mechanism-outcome) configuration. In particular an enhanced understanding of the mechanisms of action would imply that services could be improved to get these mechanisms firing more often, and in more people. These mechanisms are drawn from policy documents, strategic commissioning plans and from talking to commissioners, providers and service users. Qualitative information was about services was gleaned using semi structured interviews. An example of the questions used for the semi structured interviews is in *Appendix 2. Semi Structured Interview Questions.* Some of the questions were mainly asked to try to relax the interviewee or get them to open up rather than to directly inform the research.

The health equity dimension is also important as assessed through equity impact assessments where the primary aim is to assess the extent to which a service meets needs across the spectrum of health and social groups and in particular on the main areas identified in the Marmot report (2011).

Figure 13. Main methods used in this thesis.

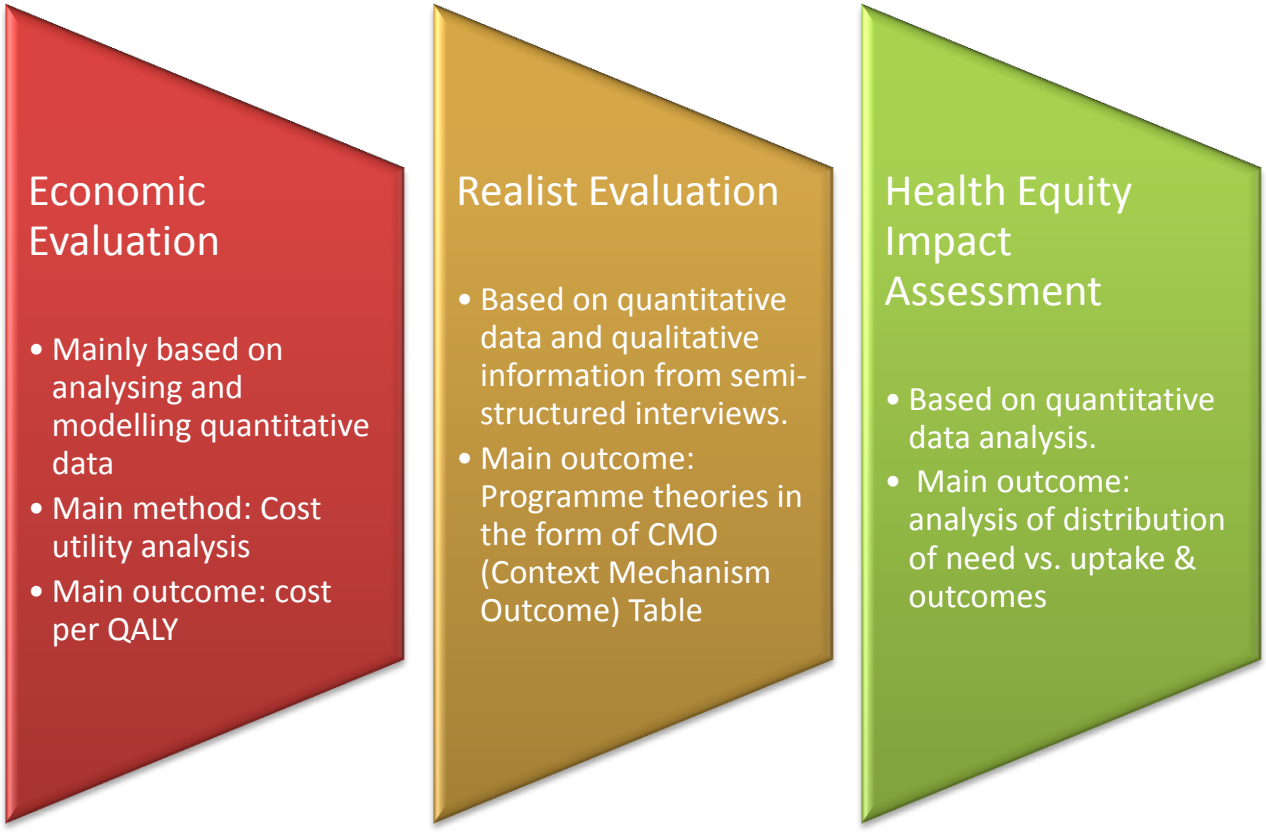


Table 7 shows the data available for each service considered in the case studies in the subsequent chapters. Costs and QALYs were estimated for all services while hospital admissions were measured for alcohol residential detoxification, and crime was measured for the Drugs Intervention Programme. Social care and personal costs were not included as outcomes in any of the case studies as this data was not available or was difficult to estimate.

Table 7. Summary of time period and outcomes included in case studies.

Service	**Chapter**	**Time period**	**Service costs**	**Quit/recovery outcomes**	**Health outcomes**	**QALYs**	**Crime**	**Hospital admissions**
Stop smoking services	5	2013/14 FY	D	D	E	E		
Specialist alcohol treatment	6	2011/12 FY	D	D	SR /E	E		
Alcohol residential rehabilitation	6	2010/11 & 2011/12 FY	D	D	SR /E	E		D
Drug treatment - opiate & crack users - CWP	7	2012/13 FY	D	D	SR /E	E	E	
Drug treatment - cannabis & stimulant users - ARCH	7	2011/12 & 2012/13 FY	D	D	SR /E	E		
Drug Intervention Programme - criminal justice intervention	7	April - September 2013	D	D	SR /E	E	D	

D=direct real data, E= estimated, SR=self report.

Chapter 5. Economic Evaluation of Smoking Services

5.1 Smoking - Burden of Disease

Tobacco is the greatest preventable cause of illness and early death in the world, and in the UK. Chronic lung diseases (COPD) which are mainly caused by smoking cost an estimated 2.1 trillion US dollars a year globally. Tobacco is a highly addictive substance, which individuals find hard to give up even when they have suffered personal health losses. For example 60% of people smoke again post-myocardial infarction, 50% smoke again even when they have had their larynx removed following cancer (Bobak, 2009). In addition despite the evidence concerning the potential health loss to their baby, as much as 80% of women fail to stop smoking during their pregnancy. The addictive nature of tobacco is emphasised by the fact that most smokers regret taking up smoking and want to quit (Bobak, 2009).

In the UK, although only approximately 20% of people smoke smoking is still the major contributory factor in 100,000 deaths per year meaning that smoking kills more people than obesity and alcohol combined. Treating smoking-related diseases cost the NHS £5.2billion per year in 2005/06 (Allender, 2009) and the wider economy £2.5 billion in sick leave and lost productivity. The Policy Exchange (Nash & Featherstone, 2010) estimated the total cost imposed on UK society by smoking to be £13.74 billion. This included £2.7bn cost of smoking related illness, the loss in productivity from smoking breaks (£2.9bn) and increased absenteeism (£2.5bn),the cost of cleaning up cigarette butts (£342 million), fires (£507m) and the loss of economic output resulted from the death of active smokers (£4.1bn) and passive smokers (£713m).

The tobacco industry point to the £10billion per year in taxes contributed by smokers and emphasize that this represents 2% of total government revenue (ASH, 2014). However such an argument ignores the health loss suffered by individual smokers and the fact that taxation would rise from other sectors if expenditure currently devoted to smoking was diverted to other taxable goods and services that would benefit both the individual and the economy to a greater degree.

Tobacco contains many chemicals but the most important in terms of public health and addiction is nicotine, although it is the other chemicals and the carbon monoxide produced which mainly cause health problems. Nicotine is an alkaloid stimulant which is absorbed from tobacco smoke through the large surface area of the lungs and leads to dopamine release in the nucleus accumbens in the brain, similar to cocaine (Pontieri et al., 1996). In

terms of conditioning, this dopamine release reinforces the behaviour through triggering the brains reward pathways. And as with cocaine, prolonged exposure to nicotine reduces the amount of dopamine released in response to other pleasurable activities like sex or eating food (Henningfield & Benowitz, 2004). Dopamine is related to 'seeking' or 'wanting' which is seen with drugs like cocaine as opposed to 'liking' which is seen with opiate drugs like heroin.

Smoking remains the biggest cause of health inequalities in the UK (DH, 2011) and therefore efforts to reduce health inequalities must focus on smoking as a priority. Smoking causes health inequalities in several ways; the ill health from smoking reduces an individual's lifespan and capacity to work; and also smoking is expensive - individuals on income support may spend 15% of their disposable income on tobacco even if they or their families have to go without more essential items (Acheson, 1998). Reducing the gap between rich and poor in smoking prevalence would therefore significantly contribute towards reducing the gap between rich and poor in premature death rates. This is particularly important as unhealthy lifestyle behaviours (smoking, excessive alcohol use, poor diet, and low levels of physical activity) tend to combine to impose a significant health loss in the most deprived populations (Buck & Frosini, 2012). In response public health policies and interventions must become more holistic and integrated to successfully reduce health inequalities resulting from unhealthy life choices.

The most recent key national policy document is ' Healthy Lives, Healthy People, a Tobacco Control Plan for England (DH, 2011)' which followed 'A Smokefree Future: a Tobacco Control Strategy for England' (HM Government, 2010a) and 'Smoking Kills' (HM Government, 1998). In addition there are several pieces of NICE Guidance which make recommendations around tobacco, including around preventing tobacco use in young people, brief interventions, workplace intervention, and harm reduction. The National Centre for Smoking Cessation and Training (NCSCT) was established in 2009 to improve the delivery, management and commissioning of smoking cessation support services in England. The Public Health Outcomes Framework published in 2012 set three target domains measuring success in reducing smoking prevalence in 15 year olds, adults, and pregnant women.

- **2.3** Smoking status at time of delivery per 100 maternities (National target is to reduce from a 2010 baseline of 14% to 11% or less by 2015, most recent for Wirral was around 12%, although Wirral has data quality issues)

- **2.9** Prevalence of smoking among 15 year olds (National target is to reduce from a 2010 baseline of 15% to 12% or less by 2015 – not currently measured at LA level but most recent national prevalence is 8% regular smokers)
- **2.14** Prevalence of smoking among persons aged 18 years and over (National target is to reduce from a 2010 baseline of 21.2% to 18.5% or less by 2015, currently for Wirral prevalence is 18.4% so Wirral was on course to exceed this target, although prevalence estimates do fluctuate).

(Data from PHE, 2014a)

Smoking prevalence

There are currently two main sources for smoking prevalence data. The integrated household survey (IHS) is commissioned nationally by ONS and measures smoking prevalence for all adults and for routine and manual groups in Wirral. There have also been locally commissioned smoking surveys which include an estimate of overall smoking prevalence as well as looking specifically at the most deprived areas of Wirral.

Based on the IHS (2014), smoking prevalence in Wirral has dropped substantially in the last 4 years data and was 18.4% in 2013 (Figure 14). However this is an estimate and is subject to a degree of uncertainty. Smoking in routine and manual groups is higher than the general population at around 24-30% (Figure 15).

Figure 14. Smoking Prevalence from Integrated Household Survey, 2010-2013. Shown with 95% confidence intervals.

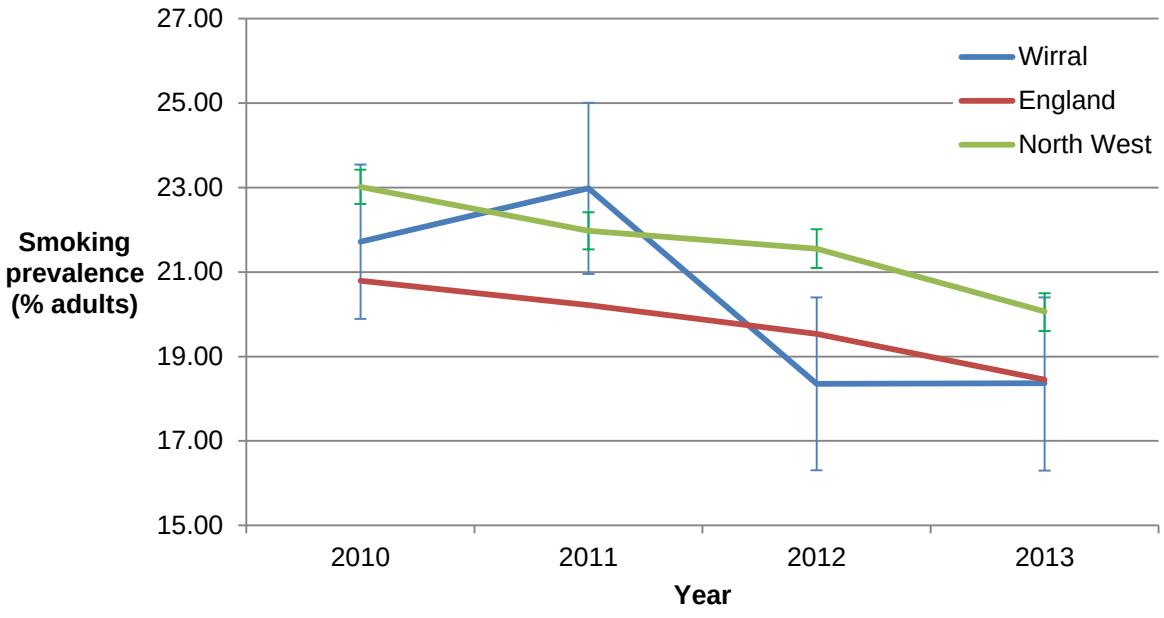
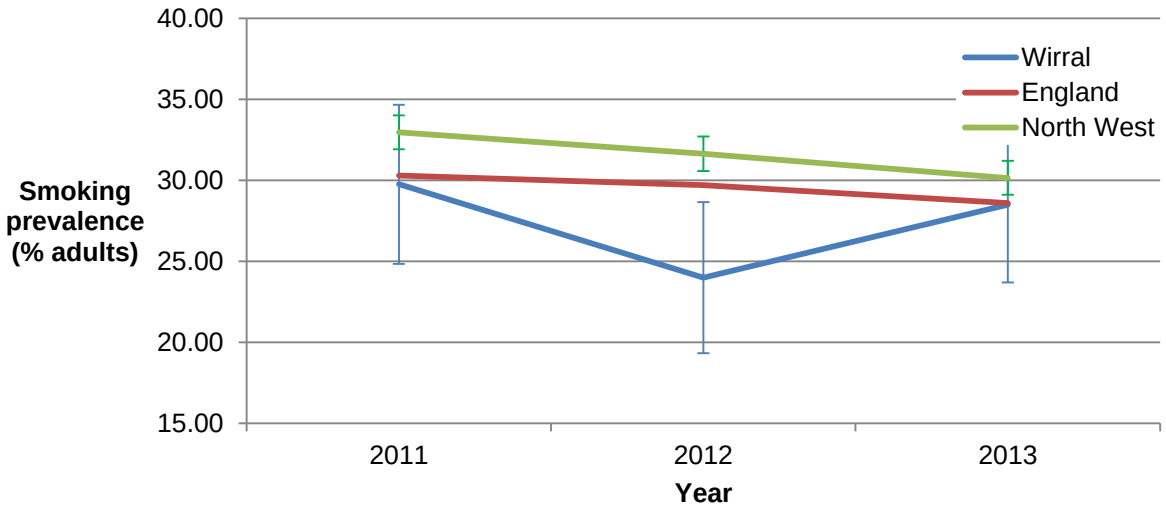


Figure 15. Routine & Manual Groups – Smoking Prevalence, 2011-2013. Shown with 95% confidence intervals.



Wirral has periodically commissioned local prevalence surveys (e.g. Praxis, 2012). Before the public health outcomes framework was brought in 2012, there was little accurate smoking prevalence data available at local authority level. The local surveys have been useful in focusing on the most deprived areas, providing data about tobacco products used and their frequency, quit attempts and abstinence, access to counterfeit or duty free cigarettes, smoking in the car and the home, and cannabis usage. Prevalence in this survey for 2012 was 31.4% of the population surveyed, however because the survey is focused in the most deprived areas this is not indicative of the whole Wirral population (Praxis, 2012). This survey found that smoking prevalence had fallen since 2009 significantly in women but not in men. This chimes with the fact that more women have quit with stop smoking services than men (see Table 8). Overall the survey found that around 60% of quitters use stop smoking services, while around 40% do it using their own willpower and resources.

Table 8. Results from Wirral local smoking prevalence survey, 2009-2012. Smoking prevalence in most deprived areas of Wirral (from Praxis, 2012).

Classification [Sample size, 2012]	**2009**	**2010**	**2011**	**2012**	**+/- Variation 2009 – 2012**	**95% C.I.**	**Statistically significant change?**
Overall Smoking Prevalence	34.7%	34.5%	33.2%	31.4%	- 3.3%	+/- 1.55	Yes
Male [1381]	35.1%	35.5%	35.3%	36.2%	+1.1%	+/- 2.53	No
Female [1998]	34.5%	33.8%	31.7%	28.9%	-5.6%	+/- 1.99	Yes

The local survey found that smoking prevalence was highest in routine and manual groups (33%) than other groups (26%) and was higher in White British groups (32%) than Black and Minority ethnic groups (18%). The survey also found that smoking had fallen most significantly in 20-24 year olds and 35-49 year olds (Table 9). The fact that smoking has fallen in younger age groups is positive as it indicates that fewer young people are taking up smoking.

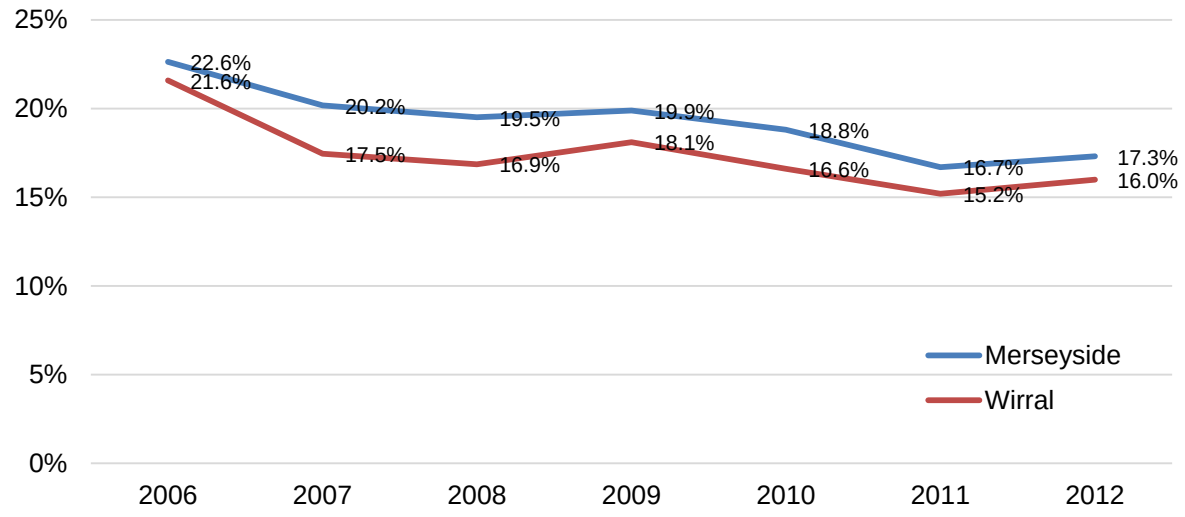
Table 9. Smoking prevalence by age, Wirral most deprived areas, 2009-2012 from local prevalence survey (from Praxis, 2012).

Age group [sample size]	**2009**	**2010**	**2011**	**2012**	**+/- Variation 2009 – 2012**	**95% C.I.**	**Result**
16 – 19 [95]	38.3%	30.3%	35.8%	31.6%	- 6.7%	+/- 9.35	Not Significant
20 – 24 [213]	38.9%	36.9%	31.4%	31.0%	- 7.9%	+/- 6.21	Significant
25 – 34 [556]	43.2%	38.7%	40.5%	38.5%	- 4.7%	+/- 4.04	Not Significant
35 – 49 [878]	42.2%	41.0%	40.4%	37.2%	- 5.0%	+/- 3.20	Significant
50 – 59 [555]	37.1%	40.1%	34.5%	35.5%	- 1.6%	+/- 3.98	Not Significant
60+ [1129]	24.2%	25.5%	24.4%	21.8%	-2.4%	+/- 2.41	Not Significant

Smoking prevalence has also been collected by the fire brigade as part of local fire safety checks. The prevalence as measured on these checks is lower than other smoking prevalence but there may be a question about whether they represent a random sample of the population, thinking about which groups are most likely to get fire safety checks, so are they more likely to own their own homes or be more safety conscious and risk averse and

therefore less likely to smoke etc. The most recent adult smoking prevalence based on this was 16% for Wirral (Figure 16).

Figure 16. Smoking prevalence from Fire Safety Checks.



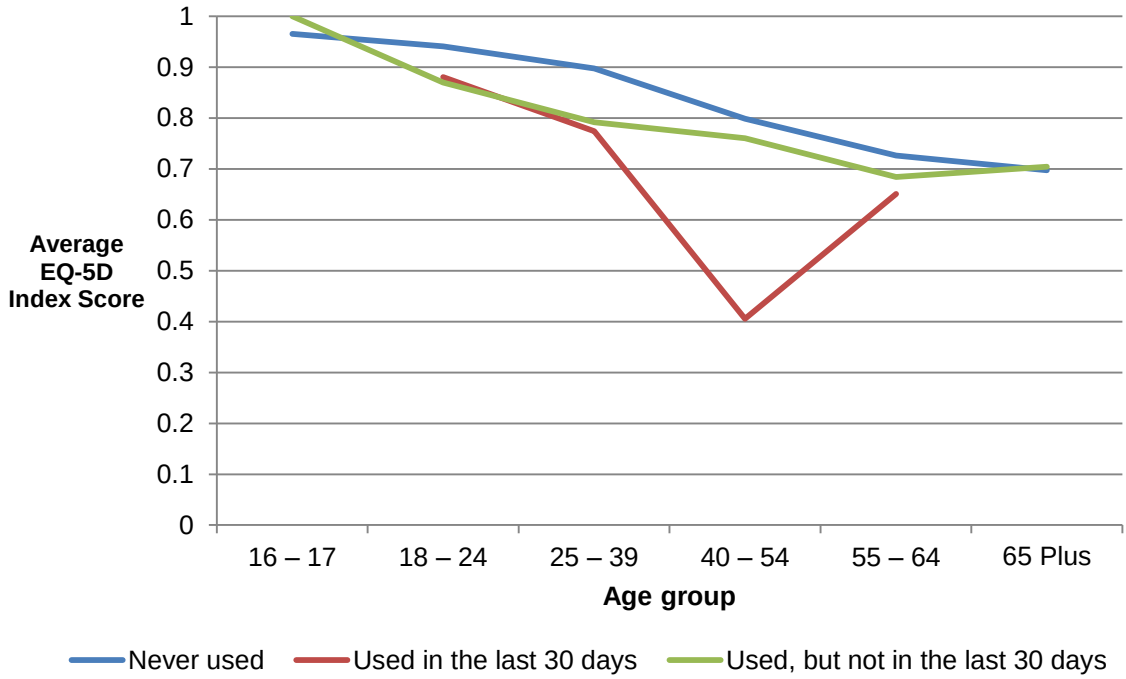
Source: Merseyside Fire & Rescue Service, 2014.

Cannabis

There is a subgroup of smokers, mainly aged 16-24, who also smoke cannabis, with the dependency on nicotine and cannabis having a combined effect where it is more difficult for clients to quit smoking or quit cannabis (Bélanger et al., 2011). Evidence suggests that this group are more likely to have psychosocial problems (Degenhart et al., 2010). Results from the Wirral wellbeing survey, carried out in 2009, showed that people who had smoked cannabis in the last 30 days (nearly all of whom were also smokers) had a significantly lower EQ-5D health-related quality of life score than the general population (0.68 vs. 0.78), but it is not clear which way the causation lies, i.e. people who have a poor quality of life may be more likely to use cannabis, or people who use cannabis may have a poorer quality of life. Regardless it shows there is a need for the health status of this group of people to be improved. The current smoking database does not record cannabis use but the next smoking prevalence survey for Wirral will include a question on cannabis.

Figure 17 shows average EQ-5D scores by age group and cannabis category.

Figure 17. Average EQ-5D Index Score, by age group and cannabis use category; never used, used in last 30 days, or used but not in the last 30 days. There were no individuals who said they had used in last 30 days in the 16-17 and 65+ age group.



Source: Raw data from Wirral wellbeing survey, 2009.

Electronic cigarettes

Widespread use of e-cigarettes has brought a new challenge to the smoking policy landscape. Electronic cigarette use seems to have plateaued at around 16% of smokers nationally (Beard et al., 2014). The World Health Organisation (WHO) has come out against them, but a lot of UK smoking policy experts believe they have potential to be a less harmful alternative to smoking. This is not an incompatible position as the WHO represents the whole world and regulation of e-cigarettes may mean that they are safe in the UK but less safe in poorer countries with less regulation. Electronic cigarette manufacturers have positioned themselves as providing a harm reduction product (Grana et al., 2014). The NCSCT [National Centre for Smoking Cessation Training] have said that stop smoking services can provide behavioural support to clients who are using electronic cigarettes and can include these clients in their national data returns (McRobbie, 2014). Stop smoking services do not currently get measured on whether they move non-smokers from e cigarettes to being nicotine-free. From 2016 e-cigarette products will be regulated by the MHRA (Medicines and Healthcare Products Regulatory Agency) so will be subject to more strict regulation. This increased regulation may hand more of the market to big tobacco companies because e-cigarettes are still made from tobacco. If e-cigarettes prove to be a safer form of nicotine then it may be that in future tobacco could be banned completely as people have the option to use e cigarettes if they wish to use a nicotine product.

Smoking in Pregnancy

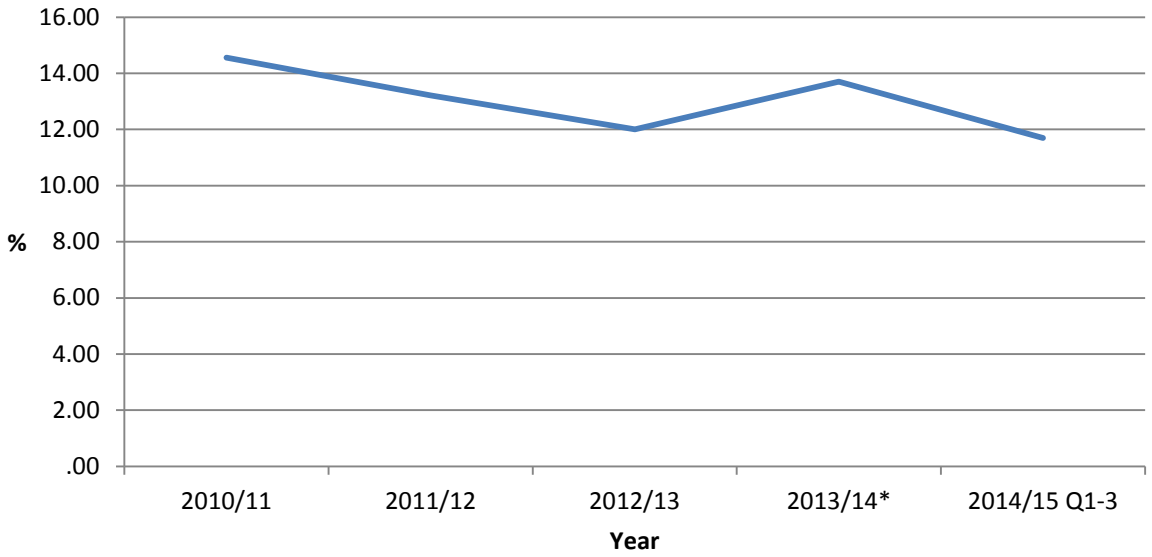
Smoking in pregnancy is related closely to deprivation, and being single, or having a partner who also smokes (Wakefield et al., 1996). Smoking while pregnant increases the risk of ectopic pregnancy, spontaneous abortion, placenta previa, abruptio placenta, preterm premature rupture of membranes, although decreases risk of preeclampsia and gestational hypertension. It also increases the risk for the infant of low birthweight, infant mortality, infections, asthma, and sudden infant death syndrome (SIDS) (Rogers, 2009). Making the financial case to the NHS and maternity hospitals is important as smoking is the biggest cause of intrauterine growth restriction, and is the biggest casual factor for women needing additional ultrasound and Doppler scans. Smoking runs in families so when parents quit it helps to break the cycle. Champix and Zyban are not licensed for use during pregnancy, but some NRT products can be used (80 out of 90 pregnant clients for Wirral were recorded as using NRT). Interventions for smoking in pregnancy need to focus on partners if they smoke as well. A Cochrane review (Lumley et al., 2009) found that the evidence around incentives for smoking cessation was mixed. Financial incentives have been found to be successful in some trials in helping pregnant women to quit smoking.

A paper by the Public Health Research Consortium (PHRC) published (Godfrey et al., 2010) put the NHS costs of maternal increased complication risk as a result of smoking at £8-64million, and infant increased illness risk as £12-23.5million. This paper estimated that spending between £13.60 - £37.00 per pregnant smoker would yield positive cost savings for the NHS. However this is not particularly useful as real costs of smoking cessation are a lot higher than this. Based on NICE's model, accounting for early mortality, the child of a quitting mother is likely to experience 23.56 discounted QALYs, compared to 23.54 for the child of a non-quitting mother. This difference is purely accounted for by the total number of life years lost due to premature death. Also the child of a smoking mother is estimated to cost around £371 more on average in health costs than the child of a quitting mother. The NICE model estimated that an expectant mother quitting would produce on average £371 in cost savings and 0.02 incremental QALYs gained. That means that to be considered cost effective (at a cost per QALY of less than £30,000) any intervention would need to cost less than £971 per quitting mother, not taking into account any additional weighting for deprivation. The service in Wirral costs around £1,100 per pregnant smoker who quits at 12 weeks, which may be cost effective once deprivation is taken into account, as pregnant smokers are more likely to be from deprived backgrounds.

Wirral's smoking at time of delivery (SATOD) data has not been published nationally for 2013/14 because the number of maternities has been under-reported, probably due to homebirths, 1 to 1 midwives, or births in hospitals outside of Wirral being missing from the

datasets. But based on the data collected for 2013/14 the proportion of mothers smoking at time of delivery was 13.7% while for quarters 1-3 of 2014/15 the proportion was 11.7%. There is a national target to reduce smoking in pregnancy to 11% or less by 2015. Services in Wirral have seen an increase in the number of pregnant women quitting smoking over the last three years.

Figure 18. Trend in women smoking at time of delivery (%), Wirral, 2010/11 – 2014/15.



* 2013/14 data was not published nationally due to data quality issues.

5.2 Smoking - Available Interventions

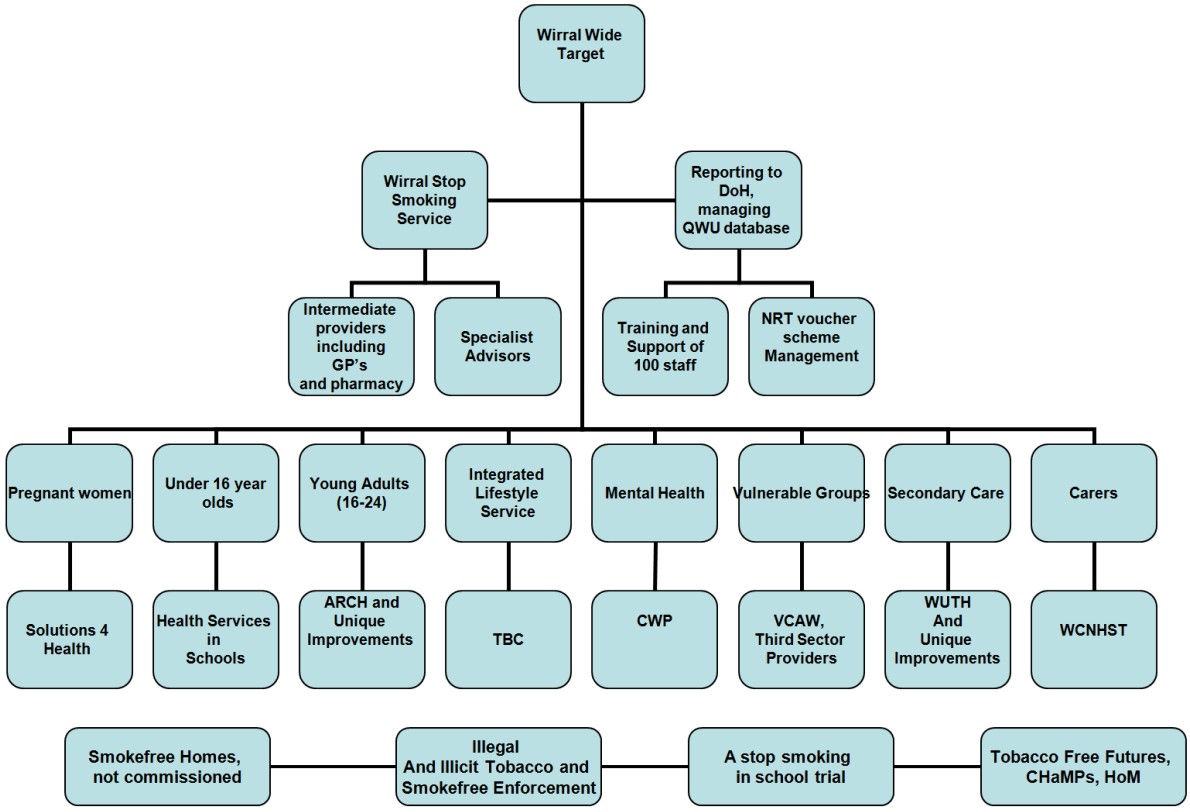
Many people do succeed in quitting smoking on their own. NHS Stop Smoking services, which rolled out nationally in 2000, were developed to help those smokers who need more support to quit. NHS Stop Smoking Services generally attract smokers with a higher level of dependency and who therefore require higher levels of support if they are to successfully quit (Kotz et al., 2009). Public health-commissioned services aim to support 3-5% of the smoking population per year in their aim to quit (Jarvis et al., 2002). Services which are more intense typically offer the greatest chance of success but reach smaller numbers of smokers (Fidler, et al., 2011). Current estimates of 12 month success rates vary from 1% for brief interventions to 31% when pharmacological therapy (Champix) is combined with specialist group behavioural support (West & Owen, 2012).

The stop smoking services give out nicotine replacement therapy (NRT) but do not prescribe other pharmacological agents, Champix and Zyban, which currently need to be prescribed by a General Practitioner or Nurse Prescriber so fall under the Wirral CCG budget. Zyban is an antidepressant type drug which relieves the withdrawal symptoms from quitting smoking.

Zyban has fallen out of use since Champix came onto the market in 2006 as Champix is more effective on average. Champix is a drug which partially blocks the nicotine receptor in the brain, reducing the effects of nicotine withdrawal while also blocking some of the pleasurable effects of smoking. Champix is effective but often has side effects, most commonly nausea and sleep disorders (Moore et al., 2011). There is a drug, Cytisine, which is similar in action to Champix, possibly with fewer side effects, which if it was licensed, could be a very cheap alternative to Champix and make cost less of an issue (Leaviss et al., 2014).

Figure 19 shows the interventions included in the smoking cessation programme for Wirral. This was produced by the service manager for Wirral. Most interventions are around smoking cessation, although there are interventions around tobacco control (stopping sales of illegal and illicit tobacco, or sales to under 18s), ASSIST (which stands for A Stop Smoking in Schools in Trial, a peer-led intervention aimed at changing social norms amongst year 8 adolescents to reduce young people taking up smoking), smokefree homes (an intervention to reduce smoking in the home, particularly for individuals with families). There are other broad interventions like the Health Action Areas (HAAs) and Health Service in Schools (HSIS) that include smoking cessation.

Figure 19. Interventions in smoking cessation programme for Wirral.



5.3 Background to Case Study

Smoking & tobacco control activity makes up a large proportion of the public health budget both in Wirral and throughout the NHS thus emphasising the importance of optimising both the clinical and economic efficiency with which resources devoted to this area are utilised. In 2013/14 Wirral Council spent around £1.57million on smoking & tobacco control which was around 6% of the total public health spend, and a spend per head of £4.80 per head of population. Wirral's total public health spend per head was significantly higher than England.

Through the use of valid and reliable methods of economic and realist evaluation, smoking cessation programmes can be more effectively targeted with services that are proven to be more cost effective being expanded using resources that can be diverted from services that are less cost effective. It is also essential to evaluate innovative approaches to service provision. For example Wirral has piloted a Payment by Results (PbR) smoking service, whereby Wirral paid for each client who was proven to have quit at 4 and 12 weeks. This Payment by Results approach means that providers are only paid for 'success' although providers have to be prevented from 'cherry picking' clients and avoiding those highly addicted smokers who are arguably in greatest need.

5.4 Cost Effectiveness of Smoking Services - Case Study

5.4.1 Aim

The aim of this study is to determine whether services in Wirral are a cost effective use of resources and to understand the local contexts that determine whether or not the service is successful. Smoking interventions are a complex intervention (in that they most often include psychosocial or behavioural support as well as pharmacological interventions) in a complex system (as people have a range of social, environmental and economic influences and triggers that determine whether they smoke).

5.4.2 Literature review

There have been many economic modelling studies around smoking cessation (e.g. Song et al., 2002, Woolacot et al., 2002, Godfrey et al., 2010, Godfrey et al., 2011). These have all found that smoking cessation services are cost effective and often are cost saving over time. This includes interventions for pregnant women (Lumley et al., 2009), having computer or other electronic aids to increase smoking cessation (Chen et al., 2012), or anti-tobacco education in schools (Tengs et al., 2001).

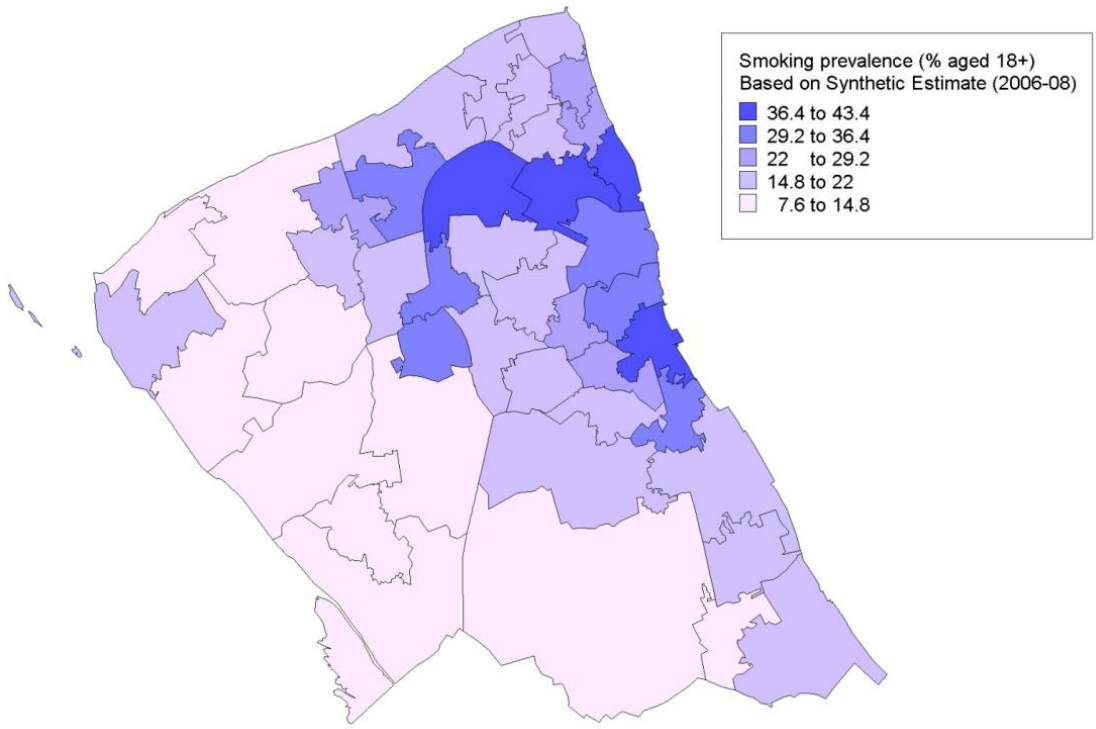
A review of realist evaluations found one published study around adding a nutritional intervention to smoking cessation (Mackenzie et al., 2009) but this majored on the nutritional element. There was one protocol for a realist evaluation of smoking services, by Douglas and colleagues (2010) who were planning to look at smoking cessation services for pregnant women and young people in North East Scotland. The CMO table has been constructed by the author from looking at policy documents around smoking, as well as the data collected by smoking services, and through talking to service providers and commissioners. The CMO configuration was included in the evaluation to encourage commissioners and providers to think particularly about the mechanisms that work to get people to successfully quit smoking so that they can think about services changes that get these mechanisms firing more often. This list does not claim to be exhaustive, and can only claim to be middle range theory. Some commentators have suggested that the context needs to be shifted so that treatment and substitution is a routine part of the environment around smoking, so for instance Nash and Featherstone (2010) suggest that all retailers should have NRT available next to tobacco products (although most now have electronic cigarettes at least).

5.4.3 Data sources

From a local perspective accurate information regarding the prevalence of smoking in Wirral has been difficult to obtain, however, since 2009 several surveys have been conducted looking at different aspects of smoking in Wirral. The main sources of prevalence data regarding smoking behaviour in Wirral are;

- Local prevalence survey and panel survey – these have been carried out over the last four years, focussing on the most deprived areas, with around 3,500 respondents. These have shown a fall in smoking prevalence in the most deprived areas (Praxis, 2012).
- Local wellbeing survey – last carried out in 2009, this included questions on smoking and also about cannabis use. This survey also included questions on general health and wellbeing (including EQ-5D and WEMWBS) which can be measured against smoking status (Deacon et al., 2010).
- The Integrated Household Survey (IHS) –. This has been carried out nationally since April 2009 and measures smoking prevalence for adults aged 16 and over. The IHS is the largest social survey produced by ONS with over 420,000 respondents nationally - the biggest pool of UK social data after the census. All IHS statistics are designated as experimental at the moment, which means they are new official statistics that are still being evaluated (ONS, 2014).
- Smoking at delivery data - has been collected by the NHS Information Centre, quarterly since 2002 (e.g. HSCIC, 2015a)
- Quality and Outcomes Framework (QOF) Data – General Practitioners get paid through QOF for having a record of smoking status for patients aged 15 and over, and for having offered advice and support to quit smoking. This was previously only collected for certain long term conditions, like CHD and diabetes (HSCIC, 2015b)
- Synthetic Estimates – synthetic estimates of smoking prevalence were based on a model applying demographic and social characteristics such as income, ethnicity, age structure of a local area to Health Survey for England data for 2006-08, to generate expected smoking prevalence. These were last produced in 2010. These went down to MSOA level (Middle-layer super output area, a statistical area with a population of c.7,500) so were useful for estimating smoking at a small area level. Based on this, Wirral had a total smoking prevalence of 21.5%, which varied at MSOA level between 7.6% and 44.4%. This is shown in Figure 20. As is the case at a higher geographical level, smoking is highly correlated with deprivation in Wirral (HSCIC, 2007).

Figure 20. Smoking prevalence by MSOA (Middle Layer Super Output Area) in Wirral, based on Health Survey for England synthetic estimates from 2006-08 data.



Source: APHO (Association of Public Health Observatories) 2012.

Since 2011, all smoking cessation activities in Wirral have been recorded in a single database ('Quit with Us') which includes:

1. Demographic data about people using services like date of birth, age, gender and postcode, ethnicity, deprivation group, socio-economic classification, employment status and type of employment.
2. Quit method – i.e. Zyban, Champix, NRT or combinations. It is not clear how reliably or consistently this is recorded. The evidence is that combination NRT is more effective than one NRT method but this is not consistently recorded.
3. Medical conditions - the most common medical conditions recorded are respiratory problems, mental health issues, high blood pressure, and heart problems.
4. Referral date and quit attempt date.
5. Carbon monoxide (CO) reading for some clients.
6. Whether someone has quit successfully at four weeks and whether it has been validated with CO reading.
7. Whether someone has quit at 12 weeks (recorded for some clients); whether someone has quit at 26 or 52 weeks (not generally recorded).

8. Type of intervention delivered - Closed Groups; Drop In; Family/Couples; One To One; Open Groups; Telephone Support.
9. Type of intervention setting, typically Stop Smoking Service, Pharmacy, Primary Care or Other; where other is split mainly between HAAs, Quit Stop, Solutions for Health, external provider, third sector, health service in schools.
10. Fagerström Nicotine Dependence test data is recorded for around 50% of clients.
11. Number of cigarettes smoked per day is recorded for around 40% of clients – the average is 18.3 cigarettes per day. 14% of clients were recorded as smoking 30 or more cigarettes per day.
12. Years smoked and number of pack years is recorded for at least 16% of clients – the database has lots of zeros which could be zero years smoked or could be not recorded. The average number of years smoked excluding zeros is 17.85 years.
13. Whether or not someone smokes at home, in the car, or lives with children (recorded for around 50% of clients).

Full data definitions are available in *Appendix 4. Smoking Treatment Data Definitions.* The treatment database does not include costing data for each service. The costing data was applied at a higher level, using the total spend on smoking cessation in Wirral which supplied by finance department.

5.4.4 Methods

The data were analysed using Microsoft Excel and SPSS. Quit rates and demographic data were analysed using regression and t tests where appropriate.

To inform the economic analysis the Wirral Health Economic Life Cohort Smoking (WHELCS) model was constructed based on the outcomes for each service over a period of one year extrapolated over a 20 years period on the assumption that 8% of four week quitters become lifetime quitters (this assumption was rigorously tested in a sensitivity analysis). This model was constructed *de novo* by the author in 2012. The epidemiological input data was not refreshed since 2012 as there was no more relevant data available.

The analysis was based on data for 1,726 smokers who quit with service support in Wirral in 2013/14. A background quit rate of 0.5% was assumed based on data used for a similar smoking cessation modelling study (Parrott et al., 2006a) and costs for staff, overheads and drugs were derived from service line reporting. The outcomes measured were number of people engaging with services, number of quitters, prevalence of diseases, Quality Adjusted Life Years, costs, and life years gained.

Long term outcomes were modelled using an individual cohort model, where the baseline model looked at prevalence, QALYs lost and healthcare costs from smoking-related diseases. These diseases were lung cancer, COPD (chronic obstructive pulmonary disease), CHD (coronary heart disease), MI (myocardial infarction or heart attack), and stroke. The baseline model was adjusted by applying the age and gender of each smoking quitter for 2013/14 and switching individuals from being smokers to be ex-smokers, and ageing them through 20 years, applying the age-specific mortality rates for non-smokers and measuring the discounted cost savings and QALY gains when compared to the baseline model. The rest of the model was kept constant over the 20 years, i.e. no assumptions were made about demographic change or background smoking prevalence changing. This cross sectional approach was chosen to isolate the effect of the intervention. 20 years was chosen because with discounting and background mortality the difference in the net effect between groups became very small after 20 years. The model did not take into account indirect effects such as reduced morbidity and mortality through reduced passive smoking.

Disease costs (Table 11) are from the NICE (2007) model. They were inflated to 2011 prices using the Hospital & Community Health Services (HCHS) inflation index (PSSRU, 2011). The costs are only for disease prevalence, not for acute events, or for deaths. They are health costs and do not include social care and other consequential costs.

Table 10. Smoking model parameters drawn from evidence.

Populations	Single year of age (SYOA) population estimates for males and females for Wirral, ONS 2010. The Census data for 2011 showed that the population of Wirral had been underestimated by around 3%; however refreshed SYOA population estimates were not available at the time of constructing this model.
Mortality	Average of mortality by single year of age for Wirral, 2007-2011 (5 years pooled) from ONS. Five years data was used to smooth out random fluctuations which may occur, particularly in age groups where deaths are rare.
Smoking prevalence	Smoking prevalence by age (16+) was taken from the Wirral smoking prevalence survey September 2011. This data is for the most deprived areas of Wirral where smoking prevalence is higher than the whole of Wirral. The proportions of men and women in three groups (current smoker, ex-smoker and never smoked) was adjusted by a factor from the IHS (Integrated Household Survey) smoking prevalence data, October 2010-September 2011, until the total smoking prevalence for males and females matched to the nearest 1%.
Disease prevalence	This was from NICE model (2007) which had disease prevalence by single year of age for smokers, ex-smokers and never smoked. The COPD prevalence came out slightly lower than the measured prevalence which may be partly because COPD definition was extended in 2011 to include more people as having mild COPD. The NICE model is from 2007. The prevalence of lung cancer was based on Peto R, Darby S, Deo H, Silcocks P, Whitley E, Doll R. Smoking, Smoking Cessation, and Lung Cancer in the UK Since 1950: Combination of National Statistics with Two Case-Control Studies. *British Medical Journal*. 2000; **321** 323-329. The prevalence of the other diseases was based on Department of Health and Human Services, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, Washington DC. The Health Consequences of Smoking: A Report by the Surgeon General. 2004.
Utility scores	This came from a NICE model for disease groups, and Wirral wellbeing survey for smokers and non-smokers - additive utility has been used which may overestimate the lost utility due to smoking, as most surviving older smokers will have more than one disease due to smoking (Feeny et al., 2002). The utility scores are shown in the table in the next section. Life years gained were given a utility score of 0.7 which was the average utility score for people aged 55 and over in Wirral, based on the 2009 wellbeing survey.
Risk of death	This was from the seminal study by Doll (1994). It is assumed that under the age of 35, the relative risk ratio of deaths of smokers/non-smokers/ex-smokers is 1:1:1.

Table 11. Smoking cost and utility estimates used.

Comorbidity / Health State	Utility	Cost per year 2006	Cost per year 2011	Data source
Lung cancer	0.58	£5,501	£6,077.97	NICE model
CHD	0.8	£1,063	£1,174.49	NICE model
MI	0.8	£2,175	£2,403.12	NICE model
COPD	0.73	£926	£1,023.12	NICE model
Stroke	0.48	£2,061	£2,277.17	NICE model
Current smoker	0.75			NICE model
Former smoker	0.78			NICE model

Current smoker	0.75013169	NW wellbeing survey data for Wirral
Former smoker	0.78597945	NW wellbeing survey data for Wirral
Non smoker	0.80193229	NW wellbeing survey data for Wirral

Changes in longer term costs and benefits as a result of smoking quitters were discounted at 3.5% per year. This is the standard discount rate recommended by the UK Treasury (HM Treasury, 2003). Discounting costs and benefits is standard in economic modelling to take into account time preference (that people prefer to receive benefits now than in the future) and that events in the future are subject to more uncertainty.

A parameter sensitivity analysis (where parameters are varied to see how sensitive the results are to these changes) was carried out where the quit rate was varied between 6% and 10%. Also the discount rate was varied between 0% and 6%. A structural sensitivity analysis (where the model type or structure is varied) was not carried out, but the results were compared to the results from the NICE return on investment tool, which is a tool for estimating the impact of smoking cessation.

For the realist evaluation, the CMO table was constructed from semi structured interviews with service providers and commissioners and through interpreting the data.

5.4.5 Results

Quits by Provider

The majority of referrals were recorded as self-referrals (83%), followed by GPs (3%) and midwives (3%). Overall 4 week quit rates were slightly higher for the third sector providers (44.1%) than for Wirral CT (41.5%). The service for pregnant women, MeTime, had a particularly high quit rate (57%, 71 quitters) although this is more intensive than other services and has a higher cost per client of around £1,100. Third sector providers had a higher proportion of quits that were confirmed with carbon monoxide (CO) readings (97%) than the main provider, Wirral Community Trust (74%). The overall CO confirmation rate was 79%.

Client Characteristics & Quit Methods Influence on Quit Rates

A preliminary regression analysis found that type of referral, age group, ethnicity, CVD and COPD status, quit method, and specifically Champix use were all significant predictors of whether or not somebody quit, although the overall impact of each of these factors was small.

Quit rates by type of intervention

Telephone support had the highest quit rate which is perhaps surprising as it may be less intensive than other forms of support, although may attract people who are more well motivated to quit.

Table 12. Quit rates by type of intervention, Wirral, 2013/14.

Type of intervention	Number of 4 week quits	Unsuccessful quit attempts	Total clients	Quit (%)
Closed Groups	80	89	169	47%
Drop In	272	294	566	48%
Family/Couples	7	7	14	50%
One To One	1272	1903	3175	40%
Open Groups	39	42	81	48%
Telephone Support	56	39	95	59%
Grand Total	1,726	2,374	4,100	42%

Quit rates by quit method

Champix [Varenicline] had a much higher success rate than any of the other major quit methods. Although Champix is much more expensive (the cost is quoted as £164), this higher quit rate would suggest that the additional investment is worth it and that it should be recommended to all smokers who are eligible and willing to try it. But as with any pharmacological agent, Champix has side effects and contraindications which may make it not appropriate for some people (Moor et al., 2011). The database did not accurately record whether people were using combination NRT or mono NRT. The evidence is that combination NRT has a higher quit rate, although for the small number of people in Wirral that were definitely using combo NRT the quit rate was actually lower than average. Zyban [Bupropion] is not used very often any more but had a high quit rate for those who used it.

Table 13. Quit rates by method, Wirral, 2013/14.

Quit Method	Number of 4 week quits	Non- 4 week quits	Total clients	Quit (%)
Champix	627	419	1046	60%
Combo NRT	12	51	63	19%
NRT [unspecified]	987	1714	2701	37%
Other	91	185	276	33%
Zyban	9	5	14	64%
Total	**1,726**	**2,374**	**4,100**	**42%**

Clients by Fagerström Nicotine Dependence Test Score

Fagerström nicotine dependence scale was measured for 50% of clients using services in Wirral. This assesses how dependent someone is on nicotine by asking questions about smoking behaviour, such as whether someone smokes within the first 5 minutes of waking, or whether someone continues to smoke when they are sick in bed, and how many cigarettes someone smokes per day. Over the last 10 years, in addition to fewer people smoking overall, the level of dependence of people who continue to smoke has dropped. Fagerström dependence scale is useful in understanding how strong someone's urge to smoke is, and can be used in formulating how much NRT to give. In terms of implementation theory and realist evaluation, Fagerström score is a context which contributes to which mechanism works best, as it measures how physiologically addicted somebody is.

Most clients in stop smoking services had a low level of dependence while only 2.4% had high dependence. The group with highest level of dependence had the highest quit rate but these differences were not statistically significant.

Table 14. Proportion of clients recorded and 4 week quit rate, Wirral, 2013/14.

Group	Fagerström Group	Quit	Didn't quit	Total	Proportion of those clients who had Fagerström measured (%)	Quit rate (%)
1	Low dependence	578	818	1396	68.0%	41%
2	Low-mod dependence	189	251	440	21.4%	43%
3	Moderate dependence	69	100	169	8.2%	41%
4	High dependence	23	26	49	2.4%	47%
	Total with Fagerström measured	859	1195	2054	100.0%	42%

Quit rates by age and gender

The average age of service users was 43 years. There were 2,309 females and 1,784 males in the service (7 with no gender recorded). The biggest age/gender groups were females 18-34 and 45-59. The highest quit rate was in women aged over 45 and men aged over 35 while younger groups had lower quit rates. Estimated smoking by age group and gender was estimated based on data from the North West wellbeing survey (Deacon et al., 2010) and compared to quits in 2013/14. Estimated smoking rates were higher in younger females than males, and were much higher for older males than older females. It is important to state that there is most likely a health survivor effect in the older age group, with smokers less likely to survive as long as non-smokers or ex-smokers.

The age group with most quits per smoker is females aged 60+, while the age group with fewest quits per smoker is males aged 60+. This indicates that maybe more needs to be done to get older men into smoking cessation. For younger men aged 18-34 there was a high rate of attempts but a lower rate of successful 4 week quits.

Table 15. Estimated number of smokers, smoking prevalence and quits per 100 smokers, by age and gender in Wirral. Based on Quit with Us Data for 2013/14 financial year.

Gender	Age group	Population	Estimated N smokers	N quit attempts	4 week quits	Attempts per 100 smokers	Quits per 100 smokers
Females	18-34	31033	9731	704	263	7.2	2.7
Females	35-44	20953	6953	476	201	6.8	2.9
Females	45-59	35004	7681	648	298	8.4	3.9
Females	60+	46253	4282	404	185	9.4	4.3
Males	18-34	29732	7322	513	171	7.0	2.3
Males	35-44	19276	6873	379	179	5.5	2.6
Males	45-59	32550	8624	491	230	5.7	2.7
Males	60+	37786	8282	318	160	3.8	1.9

Quit attempts with no age or gender recorded have been excluded.

Quit rates by ethnic groups

Some ethnic groups had low numbers using the services (less than 10) so making any strong judgment on the quit rates in these groups may not be useful. But in general it seems that overall, Asian groups have similar quit rates to White British groups while 'Other White' background and 'White Irish' groups have low quit rates, and 'Chinese' and 'any other ethnic group' have particularly low quit rates.

Quit rates by deprivation groups – Equity Impact Analysis

This section will discuss the equity implications of the stop smoking service. For smoking prevalence this used smoking by deprivation quintile data for Wirral from the North West Wellbeing Survey, 2013. Table 16 shows that smoking is highest in the most deprived quintile, with a prevalence of 37%.

Table 16. Smoking prevalence by deprivation quintile in Wirral, 2013 Wellbeing Survey.

	Deprivation Quintile	Current smoker	Ex-smoker	Non smoker	Total
1	Most deprived	37%	29%	34%	100%
2	Second most deprived	21%	35%	44%	100%
3	Third most deprived	29%	38%	33%	100%
4	Fourth most deprived	14%	25%	61%	100%
5	Least Deprived	6%	27%	67%	100%

This prevalence was then used to calculate estimated number of smokers by LSOA (lower layer super output area, which is a low level geography where each area contains approximately 1,500 residents) in Wirral, and gave a total number of smokers of 54,684 (21% of the population) which is in the same ballpark as other estimates which are generally between 18-23% of the population. For each LSOA the number of quit attempts and number of 4 week quits was also matched up and the ratio of quit attempts and quits per 100 smokers was calculated. This data was aggregated up to ward level, where wards contain roughly 10,000 - 20,000 population.

The results show that the most deprived wards have the highest ratio of quit attempts and quits per 100 smokers. The lowest ratios were for Hoylake and Meols and for Pensby and Thingwall. However the estimates for smoking prevalence are quite crude, so it may be that these wards have a lower number of smokers than these estimates suggest. These results may be used to see if more needs to be done to engage with smokers from Pensby & Thingwall. Evidence is that being from a more affluent background has a protective effect so that smokers from deprived areas are more likely to die from smoking related diseases than affluent smokers, so it maybe more important for services to focus on smokers from deprived areas.

Table 17. Estimated number of smokers, smoking prevalence and quits per 100 smokers, Wirral wards. Based on Quit with Us Data for 2013/14 financial year.

Ward	Estimated Number of smokers	Estimated smoking prevalence	Sum of Clients	Sum of Quitters	Quit attempts per 100 smokers	4 week quits per 100 smokers
Bebington	2723	18%	137	65	5.0	2.4
Bidston and St James	3074	34%	342	141	11.1	4.6
Birkenhead and Tranmere	4289	34%	496	171	11.6	4.0
Bromborough	2856	24%	201	106	7.0	3.7
Clatterbridge	790	8%	29	14	3.7	1.8
Claughton	3642	29%	209	80	5.7	2.2
Eastham	1900	17%	164	88	8.6	4.6
Greasby, Frankby and Irby	1269	9%	43	21	3.4	1.7
Heswall	908	7%	40	20	4.4	2.2
Hoylake and Meols	1893	16%	47	18	2.5	1.0
Leasowe and Moreton East	2768	26%	267	126	9.6	4.6
Liscard	3352	26%	262	110	7.8	3.3
Moreton West and Saughall Massie	2854	23%	148	86	5.2	3.0
New Brighton	2899	25%	185	80	6.4	2.8
Oxton	1971	18%	122	57	6.2	2.9
Pensby and Thingwall	1834	20%	27	9	1.5	0.5
Prenton	2878	23%	234	90	8.1	3.1
Rock Ferry	3402	30%	336	121	9.9	3.6
Seacombe	3609	30%	349	130	9.7	3.6
Upton	2799	23%	159	53	5.7	1.9
Wallasey	2147	17%	101	55	4.7	2.6
West Kirby and Thurstaston	827	9%	39	21	4.7	2.5
Wirral	**54684**	**21%**	**3937**	**1662**	**7.2**	**3.0**

Note: quit attempts and 4 week quitters that could not be matched up to LSOAs have been excluded.

Cost Effectiveness of Services

The baseline economic model was constructed in 2012 and tested as to whether it reflected the reality of health outcomes associated with smoking. The baseline model was a 'do nothing' model which aimed to describe the current state of smoking, mortality and disease prevalence in Wirral, onto which the impact of different types of interventions can be grafted. The baseline model applied mortality and morbidity age-specific risks for Wirral's current population of smokers, non-smokers and ex-smokers. The results are shown in Table 18.

The national health profiles estimate 680 smoking related deaths per year in Wirral for 2009-11; a rate of 256 per 100,000 people aged 35 and over, which is 21% higher than the

average for England as a whole. This is close to the number of deaths estimated in the model providing strong support for the validity and reliability of the model. For validating lung cancer prevalence Forman and colleagues (2003) identified a crude lung cancer prevalence of 55 people per 100,000 for England as a whole. This would equate to 170 people for Wirral which is much lower than the estimate generated in the model. Similarly the CHD prevalence estimated for Wirral in the model appears to be much higher than the GP-measured QOF (Quality and Outcomes Framework) data which is based on known disease prevalence. However, the Association of Public Health Observatories estimate CHD prevalence in Wirral to be 19,177 cases so the fact that the model estimate lies between these two figures is reassuring, while the prevalence of stroke estimated in the model is similar to that obtained from the QOF data. The COPD prevalence estimated in the model is lower than the QOF-measured prevalence (7396) and much lower than the APHO estimated prevalence (14,417). This may be because NICE's COPD definition was extended in 2011 to include milder COPD which would have previously been diagnosed as being pre-clinical. This extension of COPD diagnosis to earlier stages had a function of delivering a shock to patients to motivate them towards quitting smoking before their COPD symptoms would get more severe. The data in the model is from 2004 - before the extended definition of COPD utilised by NICE was introduced. Overall, the results obtained in the model seem to be reasonably consistent with other sources of health data relating to the Wirral population.

Table 18. Results of the baseline model for Wirral. *Source: WHELCS Model.*

Predicted totals - baseline model	**All 16+**	**All 16+**	**All 16+**	**Comparator to triangulate data**	**Ratio of Model to Comparator**	**Source of comparator data**
	Males	Females	Persons			
Population	117510	132623	250,133			
Smokers	30259	29968	60,228	57,577	1.05	Mosaic Public Sector
Ex-smokers	38416	42247	80,663			
Never smoked	48835	60407	109,242			
Smokers (%)	26%	23%	24%	24%	1.0	Integrated Household Survey
Lung cancer prevalence	297	135	432			
CHD prevalence	9671	7379	17,050	13,769	1.24	QOF Data
Myocardial Infarction prevalence	4496	1986	6,482			
COPD prevalence	2781	3622	6,403	7,396	0.87	QOF Data
Stroke prevalence	3420	3502	6,922	7,359	0.94	QOF Data (Stroke & TIA)
Deaths - current smoker	454	457	911			
Deaths - ex smoker	834	820	1,654			
Deaths - never smoked	493	726	1,219			

Figure 21 provides an example of the outputs that can be calculated from the model. It shows survival over the next 30 years for 40 year old smokers and ex-smokers. For 40 year male old smokers, probability of surviving to 70 is around 55%, while for female ex-smokers it is around 80%. Interestingly female smokers have a similar probability of surviving to age 70 as male ex-smokers, at around 71%. This is entirely consistent with evidence from a Scottish cohort study, where it was found that smoking cancelled out the survival advantage that women have over men (Gruer et al., 2009).

Figure 21. Probability of surviving next 30 years for male and female smokers and ex-smokers in Wirral, as predicted by the model.

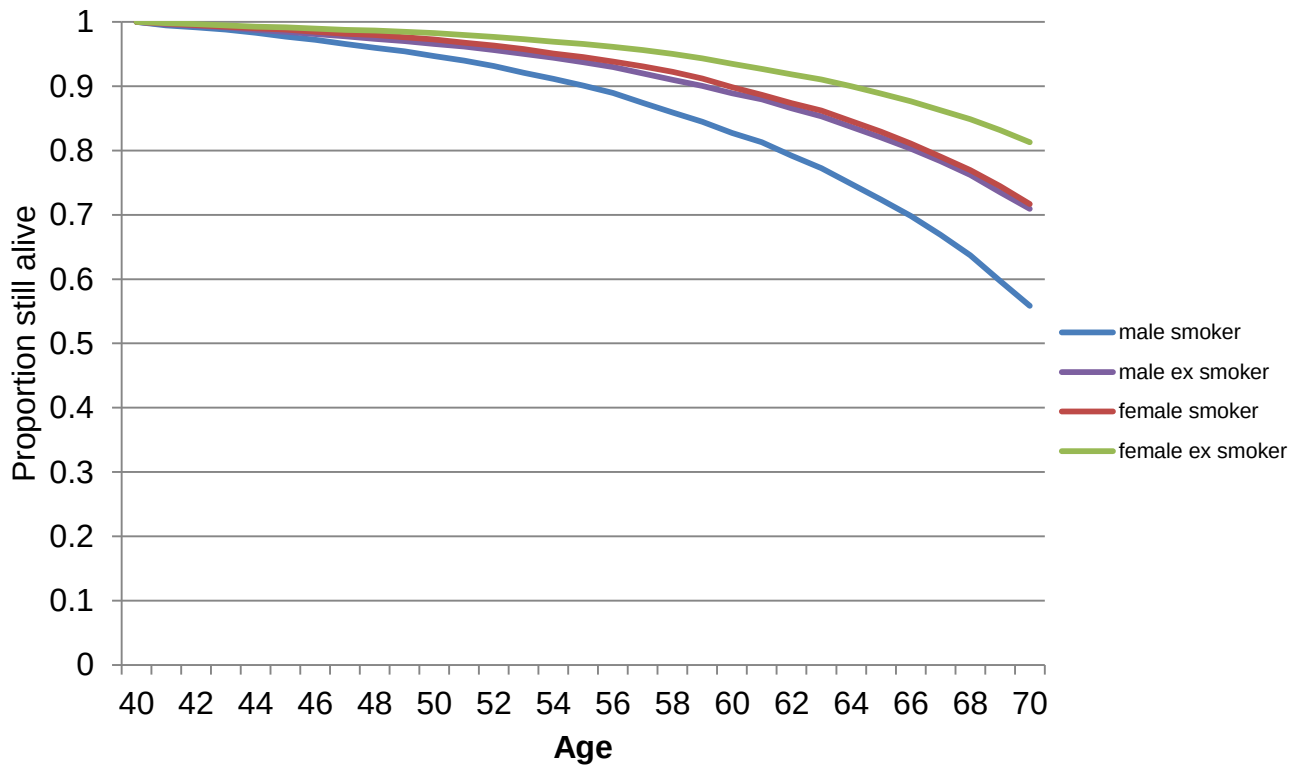


Figure 22 and Figure 23 show the proportion of males and females predicted by the model to be smokers, ex-smokers and never smoked. There are some clear quantisation effects, where the data has been grouped into age groups rather than having data for each age. Male smoking rates are highest in 24 to 35 year olds whereas female smoking rates are highest in 35 to 50 year olds. Interestingly smoking in women is lower in 20 to 24 year olds than in the two age groups either side, women aged 16 or 20, or 25 to 30, which suggests that girls under 16 are taking up smoking more. This age structure is almost the opposite of what would be expected given that young women who are from more affluent backgrounds are less likely to smoke, and are more likely to leave Wirral in their early twenties to go away to university.

Figure 22. Male smoking behaviour by age for Wirral as predicted by baseline economic model, showing proportion of total population who are current smokers, ex-smokers and never smoked, Ages 16 to 90.

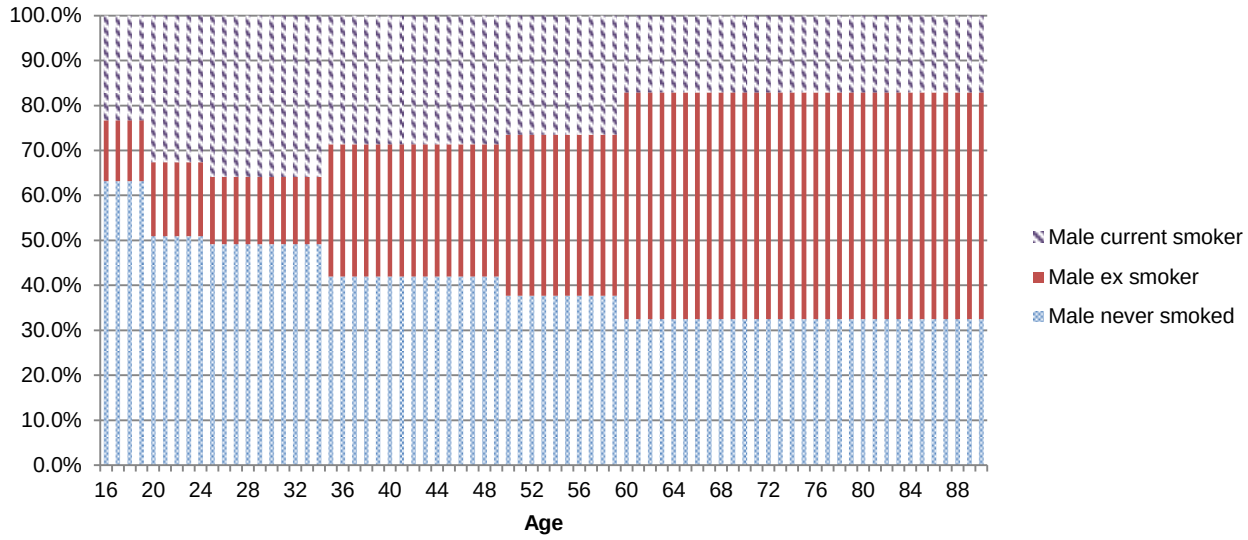
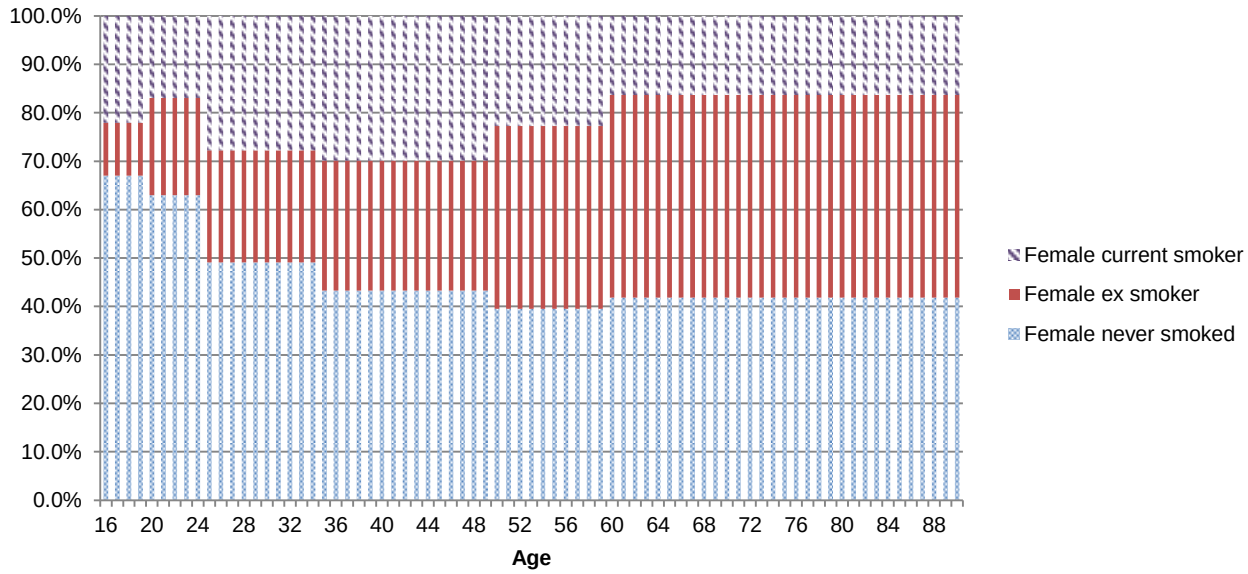


Figure 23. Female smoking behaviour by age for Wirral as predicted by baseline economic model, showing proportion of total population who are current smokers, ex-smokers and never smoked, Ages 16 to 90.



The local model considers the QALYs gained from smoking in adults through a reduction in risk of COPD, lung cancer and cardiovascular disease (heart disease and stroke) from

individuals moving from being a current smoker to being an ex-smoker, modelled over 20 years. The model also considers gains from smoking cessation in pregnant women. The model assumes a central 8% long term quit rate which is based on the 5-7% known quit rate in Scotland with some adjustment for loss to follow up (NHS Scotland, 2012). In Wirral there were 335 clients in 2013/14 who had 52 week quit status recorded, of which 302 had relapsed and only 2 reported they had still quit, which would equate to a long term quit rate of less than 1%, so there is uncertainty over what the actual long term quit rate is for smokers in Wirral. The overall central estimate of cost per QALY for services was £18,485 which would be considered cost effective, but lower than other studies of smoking cessation which have largely come out as dominant (i.e cost saving) (for example Fidler et al., 2011). This figure considers only the healthcare cost savings, not the productivity gains or gains in terms of reduced need for social care for smoking related illnesses, and reduced litter and fires caused by cigarette butts.

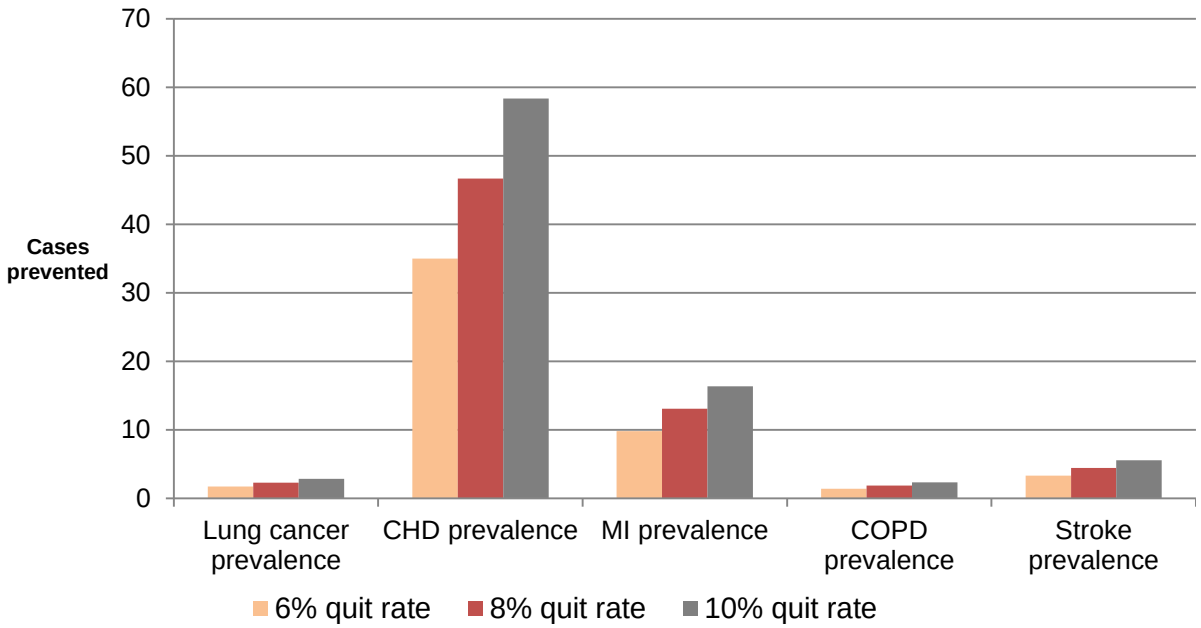
Table 19. Results of local smoking economic model for Wirral, 2013/14 FY.

	Net effect over 20 years		
Outcome	**6% quit rate**	**8% quit rate**	**10% quit rate**
Total NHS disease costs saved	£84,285	£112,380	£140,475
QALYs gained through reduced smoking related disease	43	57	71
Additional child QALYs through pregnant mothers quitting	1.72	1.72	1.72
Additional cost savings from pregnant mothers quitting	£31,906	£31,906	£31,906
Total life years gained	32	42	53
Total QALYs through life years gained (valued at 0.7)	22	30	37
Total QALYs gained	67	88	110
Total NHS cost savings	£116,191	£144,286	£172,381
Total 4 week quitters	1753	1753	1753
Cost of programme	£1,778,343	£1,778,343	£1,778,343
Net cost per QALY	£24,909	£18,485	£14,591
Cost:benefit ratio	0.82	1.08	1.33

Figure 24 provides a summary of the net result of smoking quitters over 20 years. The biggest change in number of cases is in CHD, followed by MI. Although ex-smokers have a lower risk of disease than smokers, they also have a lower risk of dying which means that more of them live to an older age to get diseases. So in terms of total disease prevalence this cancels out some of the effect of people quitting smoking. This is true for the cost savings as well, while people quitting smoking generates considerable cost savings, some of

these costs are delayed or offset, so for instance people who quit smoking are more likely to live to an older age where they get dementia and generate costs to the health and social care system.

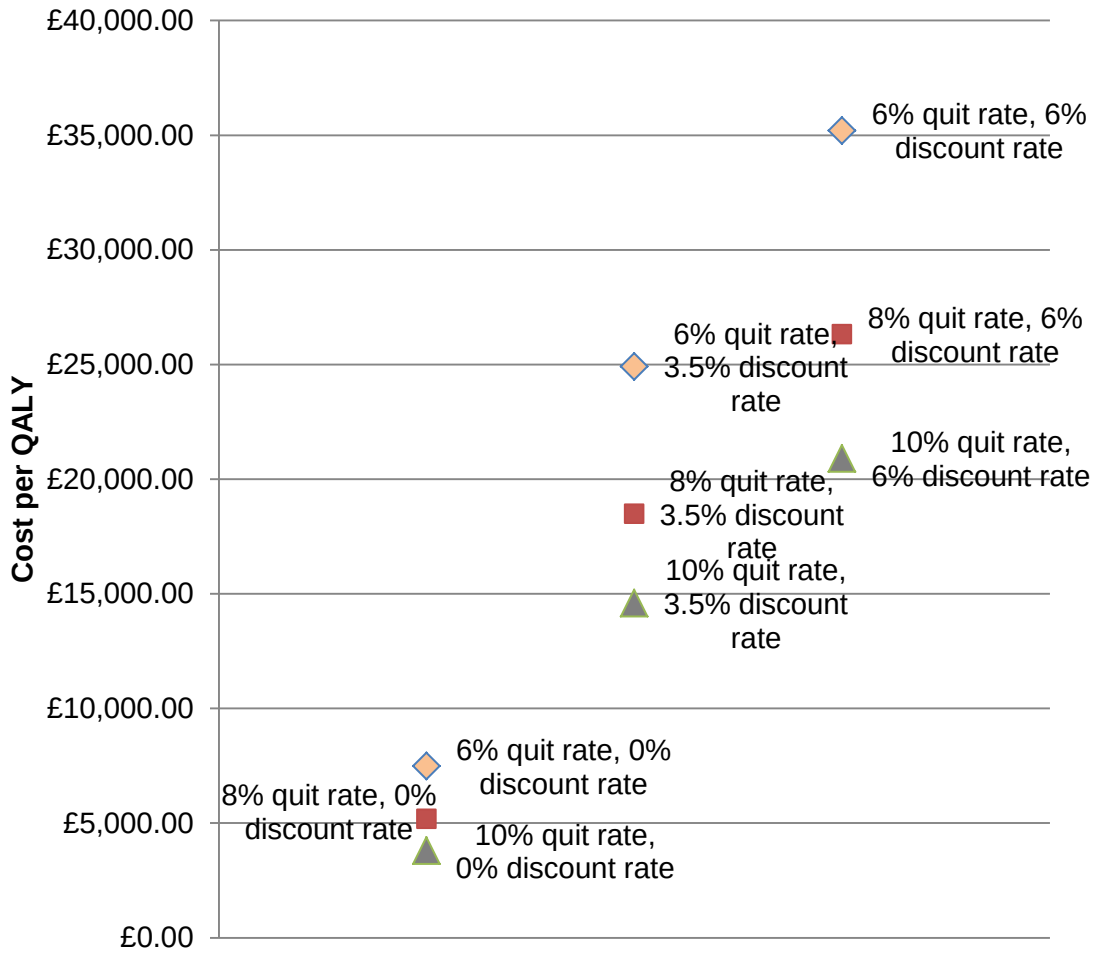
Figure 24. Net discounted reduction in disease cases over 20 years, as a result of smoking cessation activities in Wirral, 2013/14.



Cost Effectiveness - Sensitivity Analysis

The net cost per QALY (the cost per QALY after NHS cost savings) is heavily impacted by the quit rate and discounting rate chosen for the model. In their guidance for economic evaluation of public health interventions, NICE have stated that any sensitivity analysis should vary the discount rate between 0% and 6%. In the best case scenario (with discount rate at 0%, long term quit rate at 10%) the cost per QALY is £3,798 while in the worst case scenario (discount rate 6%, long term quit rate 6%); the cost per QALY is £35,197. The distribution of cost per QALYs gained for different quit rates and discount rates shown in Figure 25. As with any public health intervention that has a long payback time the cost-effectiveness of anti-smoking interventions is very sensitive to the effects of discounting.

Figure 25. Difference in cost per QALY (cost utility) for different quit rates and discount rates. Wirral smoking economic model.



Realist Evaluation – Context-Mechanism-Outcome Table

Smoking cessation programmes can be described as complex interventions in complex systems. They are complex because they often provide a mixture of pharmacological interventions such as offering NRT or Champix, and behavioural or psychosocial support, and these elements interact in different ways in different people. We do not always know what has been the crucial change in someone's reasoning or resources that has enabled someone to maintain a situation where their resolve to quit is stronger than their urge to smoke. Smoking cessation programmes exist in a complex system because people's success in giving up smoking is not driven only by physiological changes in the body; rather this success is driven by the policy and economic environment, the social environment, and people's capabilities, opportunities and motivation to change their behaviour. This is why

local tobacco control programmes also include prevention and enforcement as well as social marketing.

Table 20 shows the smoking context-mechanism-outcome table. The CMO table has been put together by looking at policy documents around smoking, as well as the data collected by smoking services, and through talking to service providers and commissioners. Including this in the evaluation was to encourage commissioners and providers to think particularly about the mechanisms that work to get people to successfully quit smoking so that they can think about services changes that get these mechanisms firing more often. This list does not claim to be exhaustive, and can only claim to be a 'middle range' theory. The CMO table acts to add some nuance to the assumptions behind the economic evaluation. Some commentators have suggested that the context needs to be shifted so that treatment and substitution are a more routine part of the environment around smoking, so for instance in 'Cough Up' they suggest that all retailers should have NRT available next to tobacco products (although most now have electronic cigarettes at least).

Table 20. Smoking cessation CMO Table. SC= source of information is local service commissioner, SM= source of information is service manager.

Group	Contexts	Mechanisms	Outcomes
Adult smokers	Wirral and the North West of England have a history of smoking culture. Although it has declined since the 1970s, smoking is still a fixture of working class culture (Hiscock et al., 2011)	People come to realise that they value their health and the opportunities that it gives them more than they value smoking (SC)	Some people do not successfully quit smoking but they realise that services are free and approachable for when they are ready to try again; they may also recommend services to others (SM)
Adult smokers	Smoking was originally more popular in men and affluent groups but for the last 50 years it has become popular in women and in routine and manual groups (Kotz & Westm 2009).	Many people come to services as the result of a health shock, such as a diagnosis of CVD or COPD which puts them in a mind-set where they are receptive to messages about change. Some people come as a result of being told by a health professional (GP) that they have to attend SSS. This presents a different scenario for the SSS as the client may still be in pre-contemplation stage for quitting (SM).	Some people quit smoking, and get better health as a result as well as financial benefits. This can contribute to NHS cost savings, as well as savings to other public agencies and increased economic productivity. People who quit then contribute to smoking becoming less of a norm and less socially acceptable to their family, friends and neighbours (SC).

Group	Contexts	Mechanisms	Outcomes
Adult smokers	For many people in routine and manual groups, smoking is associated with work breaks, or socialising and drinking alcohol (McEwen et al., 2008).	Many people will be pressured by family or friends to stop smoking or experience significant life changes e.g. new job or new baby (SC).	
Adult smokers	Smokers from deprived areas spend 15% of their disposable income on tobacco (ASH, 2005)	People realise that spending a large proportion of their disposable income on cigarettes does not make sense (SC)	When people quit there will be reduced revenue from tobacco sales but many people will spend the same money on other goods so it is not lost to the economy altogether (ASH, 2015).
Adult smokers	As well as routine and manual workers, certain groups such as carers and people with mental health problems are more likely to smoke (ASH, 2005).	Group sessions for people with similar experiences can reinforce a sense of identity and group dynamic around the transition to being a non-smoker (SC)	
Adult smokers	Smoking cessation has been available through the NHS since the 1990s and successive national policy measures have been brought in to make smoking more expensive and more difficult, such as increasing the age of buying tobacco from 16 to 18, and banning smoking in indoor public places (Hill et al., 2014).	Pharmacological therapies (e.g. NRT) reduce the cravings, or Champix reduces cravings while also reducing the pleasure gained from smoking (Heydari et al., 2014).	
Chewing tobacco users	Some stop smoking advisors are for specific groups e.g. chewing tobacco, illicit tobacco (SM)	Advisors advocate giving up chewing tobacco during Ramadan where Muslims do not use it during the day so it is a good time to get people out of the habit. Advisors also push Muslims to quit smoking with quotes from religious leaders saying that quitting "will be an act of ibadah (worship) that helps to keep you healthier." (SC)	

Group	Contexts	Mechanisms	Outcomes
Pregnant women	Wirral has historically high rates of smoking in pregnancy compared to other areas. It may be the case that smoking messages need to be delivered to mothers earlier, before they even get pregnant, for them to be most effective (HSCIC, 2015a; SC)	The implementation of Payment by Results (PbR) mechanisms has meant that services only get paid when pregnant women successfully quit (SC)	The number of pregnant women quitting has increased considerably over the last 3 years (local data).
The service	Mass media campaigns like Stoptober, which is deliberately timed so that smokers who have gone on holiday abroad in the summer and bought cheap cigarettes will have used them up by October (SC).		
The service	E cigarettes have produced a sea change in culture. The number of people changing to e cigs has proven how many smokers want to have a healthier lifestyle. E cigs have split the academic and tobacco control community. Local leaders in Wirral recognise that e cigs have got a capacity to improve the health of many people but that surveillance and product regulation is needed (SC)	Electronic cigarettes may be a stepping stone to some people becoming tobacco free, and can be a hook to get people into services. However it may be that they replace the need for traditional services (McNeil et al., 2015)	Some people will quit tobacco with e cigs. There is a theoretical risk of young people taking up e cigarettes, and a risk that they might prolong dependence on nicotine, but there is not a lot of evidence for this at the moment (McNeil et al., 2015).
The service	It can take a long time to make changes to stop smoking services; everything has protocols and standards, which are based on years of research and evidence. However this can stifle innovation (SM).		
The service	There is a lot of potential in self-care and digital support which may be a lot more efficient and fit in with an asset-based agenda. Locally it is believed that this potential is untapped (SC).	The service could make better use of social media platforms such as Facebook; Twitter; Instagram. However it would have to ensure that this was done in a cost effective way (SM).	

Group	Contexts	Mechanisms	Outcomes
The service	In the past services offered 'Quit and Win' where smokers could win prizes, which was a financial incentive to quit. This is not currently offered. Under this system smoking advisors did not have to assess smoker's motivations to quit, which they usually have to do (SM).	Financial incentives can work, with even small amounts of money. They give smokers an excuse to discontinue a behaviour that is part of their peer group. To some outsiders and non-smokers, these schemes can be seen as rewarding unhealthy choices however (Giles et al., 2015).	The financial incentives offered in Wirral were successful in increasing quit rates - there were some inappropriate referrals for people who were not ready to quit, but the overall quit rate was still reasonable and much better than without the intervention. There may be some potential for rewarding quitting with non-financial incentives (SC).
The service	Stop smoking services have been around for so long it is difficult to keep them fresh (SC).	Trading Standards have a commissioned programme of work (commissioned on activity) that covers Under Age sales and also working with local retailers re: illegal and illicit tobacco (SC).	Making better links with other services will improve outcomes (SC).
The service	New York has shown that smoking prevalence can be dramatically reduced to around 10%, possibly refuting the idea that eventually as prevalence decreases areas are left only with 'refuseniks' - hard-core smokers who will never quit (Coady et al., 2013).	This rapid improvement in New York reinforces the belief in people in tobacco control community that quick change is possible, although ASH have said that disinvestment in tobacco measures has led to an increase in smoking prevalence in New York (SC)	
The service	The service has continuously met its target of reaching around 5% of smokers. There is always a compromise between getting a high volume of people through a service and getting a high rate of quitters (SC).	The service is struggling to reach targets as fewer smokers are accessing it; this will be due to e-cig use, as well as there being fewer smokers, and the residual smokers being those who find it hardest to quit (SM)	There are fewer people accessing the service than two years ago (SC)
Young people	Most people took up smoking while they were still children (SM).	People may realise that if they would not want their children and grandchildren to smoke, so they should not smoke themselves (SC).	
Young people	Young women often smoke because they think it helps them to control their weight (Doxie & Hammond, 2011).		

Group	Contexts	Mechanisms	Outcomes
Young people	Young people are using rolled tobacco more, partly because they believe it is cheaper than cigarettes and possibly because it is being marketed to young people more, with 'funky packaging'. Some people incorrectly believe that hand rolled tobacco is a healthier option & more fresh, organic or natural (Moodie et al., 2012).		There is a need to find ways to bust the myths around that exist around hand rolled tobacco (SC)
Young people	Some people (mainly young people) smoke tobacco with cannabis. There is a culture around thinking that cannabis is not harmful and it is becoming decriminalised in parts of the USA (Crick et al., 2013)		
Young people	Young people are born into a world without tobacco advertising (de Andrade et al., 2013)	Many young people are very much psychologically against the idea of smoking, but there is less information about how people feel about vaping e cigarettes (de Andrade et al., 2013)	Young people are less likely to take up smoking when they have not encountered it (SC).
Young people	Anti-smoking programmes directed at children and young people have not been particularly effective so far. Wirral has used ASSIST which is a peer led intervention (Hollingworth et al., 2012).	In the absence of any successful programmes, some young people may still be tempted to try smoking. Young people do not connect with long term health impacts re; tobacco use but they do connect with the negative practices of the tobacco industry e.g. issues such as child labour, deforestation, unethical marketing and media and advertising. This is important because the liquid in e cigarettes is still made from tobacco so causes a lot of the same global problems (SC).	Some young people may still take up smoking, particularly in deprived communities (SC).

5.4.6 Discussion

Smoking cessation is a complex intervention in a complex system and the ecosystem around smoking is changing every year. For example electronic cigarettes are now being marketed as a harm reduction aid. There is conflicting evidence on whether e-cigarettes will expose a new generation to nicotine, with a recent study finding that many teenagers had tried e-cigarettes (Hughes et al., 2015). The UK has led the way in terms of policy measures being brought in to make smoking less marketed and less socially acceptable, including measures brought in since 2010 by the Conservative-led coalition government who may have been expected to have more of a free market leaning.

A comprehensive cost effectiveness analysis of smoking services in Wirral was previously carried out by this researcher in 2012, looking at data for 2011/12 financial year (Collins, 2012). This found that smoking services were highly cost effective, having achieved 3,379 four week quitters. In 2014 the model was refreshed and this found that the number of people setting a quit date in 2012/13 was 5,403 of whom 42% quit at four weeks. The number of quits in 2012/13 was 2,259 compared with 3,379 the year before (so was one third lower). The number of quits in pregnant women had risen significantly from 21 in 2011/12 to 69 in 2012/13 and 81 in 2013/14. In 2013/14 there were 1,729 quits which means that quit rates have fallen by 49% in 2 years. This is a massive change in smoking cessation rates and has caused commissioners and service providers to worry that the service is no longer successful in engaging with smokers. The quit rate as a proportion of people using the service has not dropped so the issue is getting people to engage with the service. The likely cause is a combination of a reduction in the overall pool of smokers as prevalence has dropped; the remaining smokers being more of a ‘hardcore’ who find it particularly difficult to quit, and many smokers, who may have used the service, choosing instead to use e-cigarettes as a harm reduction measure or aid to quit.

The results from the WHELCS model provide evidence that smoking cessation services should provide benefits for individuals through better quality of life and more years of life. The model is looking at smoking cessation in isolation, when in fact several public health interventions are delivered in a more integrated fashion so this model does not take into account the potential synergy between different interventions. The model also does not explicitly consider diminishing returns; i.e. that as interventions cast the net wider to get more clients they may get people who are less motivated to change. As stated previously the model does not explicitly take into account the effect of smoking cessation services on decreasing health inequalities, so has not added an additional weighting for health gains for

people from deprived areas, which some public health models have done (e.g. Lister & Merritt, 2013). Instead a separate health equity impact assessment was carried out.

There have been other tools which estimate the cost effectiveness of smoking cessation interventions including the National Social Marketing Centre's Value for Money Tools (Lister & Merritt, 2013), and the NICE Return on Investment Tool for tobacco control (Pohkrel et al., 2014). These tools are based on good evidence and are useful for commissioners. These tools assume a higher long term quit rate than has been assumed in our model, and as a result the stop smoking services would be analysed as being a lot more cost effective.

In 2013 NICE produced guidance PH45 recommending a harm reduction approach calling for a reduction in smoking intensity for smokers who find it impossible to quit completely. This approach has the potential to get more smokers engaged with services, but also could be potentially less cost effective, if health benefits are watered down as a consequence of failure to achieve smoking cessation. There have also been several attempts to produce a nicotine vaccine that blocks the pleasurable effects from smoking, either for children to reduce uptake, or to help smokers to quit. This is still several years away and may pose ethical questions.

This work is the most recent iteration of a programme of evaluation work that was carried out over three years. The results of these analyses have been presented to Wirral council leading to several of the recommendations being incorporated into commissioning guidelines. For example Payment by Results (PbR) services were expanded and a dedicated service established to support joint cannabis and tobacco users. In addition commissioners were reassured that their smoking cessation services has been rigorously evaluated and found to be cost effective even when using a very conservative set of assumptions. This work was useful in getting cross party agreement in the council in calling for generic packaging for cigarettes. A comprehensive set of recommendations were derived from this analysis of smoking cessation policies in Wirral. These were as follows;

1. It is recommended that smoking services should be considered on a regional scale more often, for interventions to be more efficiently managed and delivered. It is difficult to achieve the change in social norms needed for population level behaviour change while working on a local footprint.
2. NICE recommend that smoking cessation programmes should engage with at least 5% of smokers and achieve a 4 week quit rate of greater than 35%, both of which services in Wirral have consistently achieved. In most years, stop smoking services in Wirral have engaged with around 1 in 9 smokers in the population.

3. Nearly 1 in 5 adults in Wirral smoke, and smoking causes around 1 in 5 deaths. Public health and partners should reinforce with the population and with partners the facts - that smoking is still the biggest lifestyle cause of ill health and early death, and helping people to quit smoking is one of the most cost effective public health interventions.
4. The most important recommendation for services is for them to really know their population groups and think about which mechanisms or triggers are most successful in reducing smoking uptake and helping smokers to quit tobacco and become nicotine free.
5. Making systems as seamless as possible and as efficient as possible is important, so making it possible for healthcare workers to book a smoker's first appointment with stop smoking services, having NRT available in healthcare settings, making every contact count, having PGDs for Champix, and using NHS Healthchecks as an opportunity to motivate smokers to quit.
6. Electronic cigarettes have sent a shock to the tobacco control landscape which is still having an effect on people's smoking behaviour and quit rates. As e-cig use continues at around 15% of smokers, decision making needs to focus on the opportunities and threats related to e-cigs. This could mean that e-cig venders and stop smoking services need to work together, but also means that services need to promote being nicotine free as an important outcome as well as being tobacco free. In future service outcomes should include whether someone has moved to e cigs or whether they are nicotine free, and also there could be some measurement and service planning to move e-cig only clients to being nicotine free.
7. Wirral have not implemented much in the way of harm reduction yet, this is likely to be less cost effective than helping people to quit outright, but should be considered.
8. Services should do more to try to monitor whether individuals have quit at 12 months. Most of the uncertainty around the cost effectiveness is around whether people do quit successfully at 12 months; most people who reach 12 months without nicotine will become lifetime quitters. If we can be certain that at least 5% of 4 week quitters (or 2% of service users) go on to become long term quitters then the service should be cost effective.
9. Wirral is implementing a PGD so that pharmacists can prescribe Champix, which is more expensive but more effective than other quit methods, with a 4 week quit rate of 60% compared to 30-40% for most other quit methods.
10. Preventing and delaying tobacco uptake in young people needs to be high priority. Services around preventing tobacco use in young people have not been particularly successful or co-ordinated in the past. Wirral Community Trust are developing interventions to prevent tobacco uptake as part of the 0-19s contract. These need to be

well planned and based on best evidence. Interventions could be developed that focus on looked after children and troubled families.

11. Having interventions for men is important as smoking prevalence has fallen less in men than in women in the last 5 years. Making it easy for working men to access services and NRT is important.
12. The quit rate for pregnant women has increased over the last few years, but the service is paid at a high tariff cost per quitter. Weighting the payment so that services are paid the full tariff when a woman has quit 2 months post pregnancy would mean that Wirral were potentially getting more value.
13. Making smoking less socially acceptable is important in motivating people to quit and reducing uptake. Measures to do this can include enforcing the ban on smoking on council premises, and trying to deter people from smoking around parks and areas where children play.
14. As the price of tobacco has increased, this reduces the amount of tobacco consumed by smokers as well as giving a financial motive to quit. Working with Trading Standards to reduce supply of illegal and illicit tobacco means that these price measures have their desired effect.
15. The PbR (Payment by Results) Stop Smoking Service was relatively successful in attracting clients from target groups, so should be considered as a future service model.
16. Future PbR services need to be able to prescribe Champix, which has the highest quit rate, as this may be a lost opportunity otherwise.
17. Senior officers in Wirral should use their voice with national organisations to lobby for more smoking legislation to create an environment that further decreases the social acceptability of smoking.

5.4.7 Conclusion

This case study has shown how economic modelling, realist evaluation, and descriptive statistics highlighting equity impact can work as an integrated methodology in evaluating a public health commissioned service. This case study was useful to commissioners and providers in understanding the successes of the smoking service and making recommendations to make the smoking service and the wider tobacco control system work better.

Chapter 6. Economic Evaluation of Alcohol Treatment Services

6.1 Alcohol - Burden of Disease

The second case study focused on alcohol treatment. It is important to acknowledge that the moderate consumption of alcohol can provide health and social benefits to individuals. For example there is some evidence that drinking small amounts of red wine can have health benefits in decreasing LDL cholesterol but the health benefits of alcohol have been hotly debated (Knott et al., 2015). The social benefits include the impact of alcohol in assisting people to relax and acting as a social lubricant. However when taken to excess either on individual occasions or on a continuous basis drinking alcohol can cause significant health and social problems as it may lead to financial problems, family problems and is also highly associated with crime and violence (WHO, 2014). Because most people in the UK are continuously exposed to alcohol, it follows that a high number of people will go on to become problem drinkers or be alcohol dependent.

Alcohol related brain damage often manifests itself in the acute phase as Wernicke-Korsakoff's encephalopathy, where people do not record new memories. This is why testing for memory problems needs to happen where people are identified as having alcohol problems and a long drinking history. Rehabilitation for people with alcohol related brain damage is currently funded outside of the public health alcohol budget and is a lot more expensive than general rehabilitation for alcohol problems. Alcohol causes liver damage which is why liver function tests should be carried out in individuals who are identified as having a long drinking history (Williams et al., 2014). Giving people their liver function results can form part of a brief intervention in terms of demonstrating the impact of an individual's drinking on their physiological markers. Wirral has a high rate of mortality from digestive diseases and liver diseases which are associated with alcohol, and it is a cause of the life expectancy gap between Wirral and England.

Alcohol use has fluctuated, and is lower now than it was at the start of the 20th century (Plant & Plant, 2006). However, the average amount of alcohol per year drunk in England & Wales has increased from 5 litres per year in the 1950s to over 11 litres per year in 2007 (Smith & Foxcroft, 2009). The alcohol market in the UK is subject to fewer restrictions than the tobacco industry as alcohol is still advertised and is heavily marketed.

Societal harm in the UK from alcohol is estimated to include one million incidents of violent crime, over 100,000 cases of domestic abuse, and hundreds of deaths from drink driving. Alcohol causes acute health problems through intoxication, violence and injury and long-

term health problems through liver and brain damage as well as other diseases. There were 8,461 alcohol related deaths in the UK in 2013, which was 1.7% of deaths (ONS, 2015c). In 2011, a sexual health needs assessment of young women in Wirral (aged 20 – 34 years) reported that alcohol was a factor in their failure to use condoms, putting them at risk of sexually transmitted infections and unplanned pregnancy.

It is also important to acknowledge that excessive alcohol consumption would appear to be socially acceptable and even applauded in many societal groups (Measham, 2006). This implies that many individuals who consume 'excessive' quantities of alcohol on a regular basis never become known to alcohol services. Alcohol Concern (2010) estimated that to provide alcohol treatment services to even 15% of dependent drinkers would require at least doubling the current national expenditure on alcohol treatment.

Measuring alcohol consumption is complicated by the fact that people consciously or unconsciously underestimate the actual amount of alcohol that they consume (Goddard, 2001). Dependent drinkers are classified based on their level of addiction to alcohol, with dependency being characterized by craving, a preoccupation with alcohol, and continued drinking despite harmful consequences. Binge drinking is defined as females drinking six or more units in one session or males drinking eight or more units in one session (Drinkaware, 2009). Increasing risk is analogous to the World Health Organisation (WHO) definition of hazardous drinking, while higher risk is analogous to their definition of harmful drinking (see Table 21).

Table 21. Units per week for increasing risk and higher risk drinking.

Units per week	Increasing risk	Higher risk
Men	21-50	50+
Women	14-35	35+

Wirral has a higher proportion of dependent drinkers and increasing risk drinkers than national, but a slightly lower proportion of higher risk drinkers (see Table 22). The risk estimates are based on local modelled drinking behaviour data from the General Lifestyle Survey while the dependent drinker estimates are based on individual's answers to the AUDIT and SADQ (Severity of Alcohol Dependence Questionnaire) in the Psychiatric Morbidity Survey Wirral had a lower proportion of abstainers than England as a whole. Qualitative evidence obtained in an ethnic minority needs assessment identified significant

alcohol misuse on Wirral amongst the Irish and Polish communities, with links to social isolation, poverty and mental health (Highton, 2014).

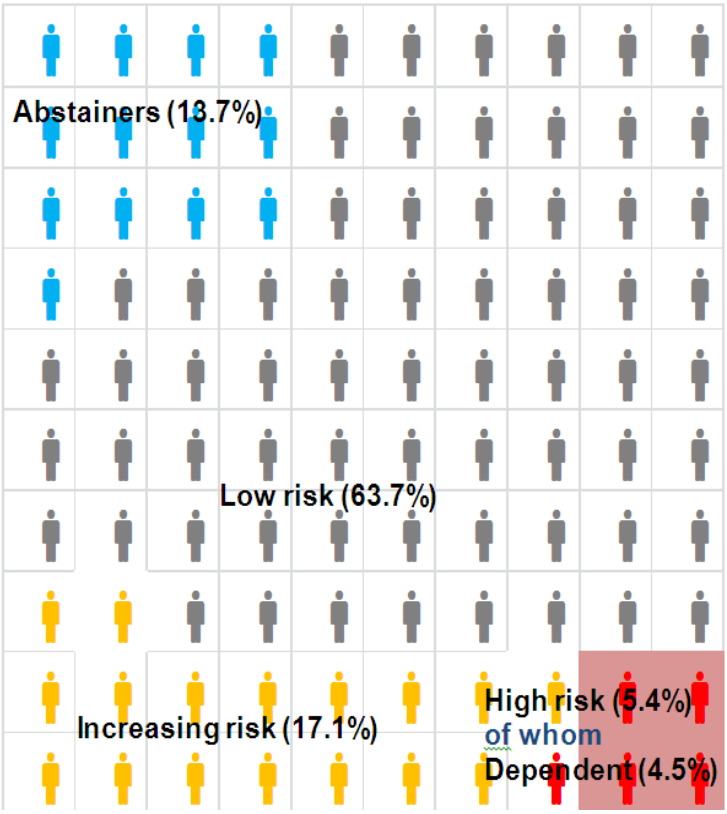
There is some 'prevention paradox' in alcohol as 'A large number of people at a small risk may give rise to more cases of disease than the small number who are at a high risk' (Rossow & Romelsjö, 2006). Although dependent drinkers have a higher risk of injury, lower risk drinkers make up a larger proportion of the population, and hence a greater number of alcohol-related injuries come from lower risk drinkers. There is also some evidence for an 'alcohol harm paradox' where people from affluent groups drink more alcohol overall than people from more deprived groups, yet suffer less alcohol-related harm, with protective factors like diet and income playing a mediating role (Smith & Foster, 2014).

Table 22. Estimated proportion of adult population who are dependent, higher risk, and increasing risk). drinkers in Wirral, North West of England, and England, 2009. The first 4 columns add up to 100%, while dependent and binge drinkers fall within increasing and higher risk drinkers.

	% of total population aged 16+ in each alcohol risk category					
	Abstain	**Lower**	**Increasing**	**Higher**	**Dependent[1]**	**Binge[2]**
North West	15.4%	62.2%	16.8%	5.6%	4.3%	23.3%
England	16.5%	61.1%	16.7%	5.6%	3.8%	20.1%
Wirral	13.7%	63.7%	17.1%	5.4%	4.5%	20.8%
Wirral (numbers)	35,846	166,178	44,544	14,195	11,760	54,238

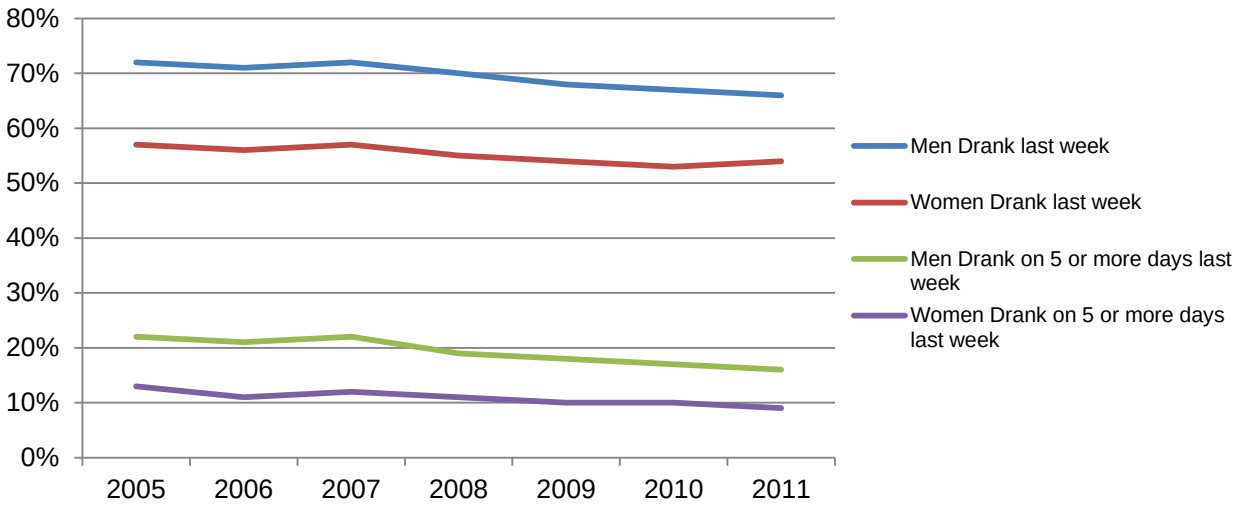
Source: NWPHO, modelled estimated based on general lifestyle survey 2009.
http://www.lape.org.uk/downloads/alcoholestimates2011.pdf
1 Data for 2008.
2 Data for 2007-08

Figure 26. Estimated proportion of adult population who are dependent, higher risk, and increasing risk drinkers and abstainers in Wirral. Shown as if Wirral were 100 people.



172 people per 100,000 of the working population in Wirral were claiming incapacity benefits with a main medical reason of 'alcoholism', significantly higher than the North West (153 per 100,000) and England (93 per 100,000) (NOMIS, 2015). In 2009 a report identified an increase in drinking amongst women, middle- and older-age groups and an increase in alcohol consumption amongst very young adolescents (Smith & Foxcroft, 2009). However the most recent general lifestyle survey data has shown overall alcohol consumption falling in the population (see Figure 27).

Figure 27. Trend in proportion of men and women drinking alcohol, and drinking on more than 5 days in the last week, Great Britain.



Source: General Lifestyle Survey - Office for National Statistics, 2012.

The North West wellbeing survey (2009) included questions on alcohol consumption and found that 11% of people within Wirral were identified as being hazardous or harmful drinkers. Figure 28 and Figure 29 provide the comparative quality of life data collected for each alcohol group. Perhaps the most surprising result was that in general non-drinkers had lower EQ-5D scores than harmful drinkers however this may be because they are older or have given up alcohol because of ill health or previous alcohol dependency. The average mental wellbeing (SWEMWBS) scores were not hugely different between groups; female hazardous drinkers had the lowest wellbeing scores at 25.75 out of 35.

Figure 28. General Health Related Quality of Life (EQ-5D Index) scores from wellbeing survey 2009 by drinking category.

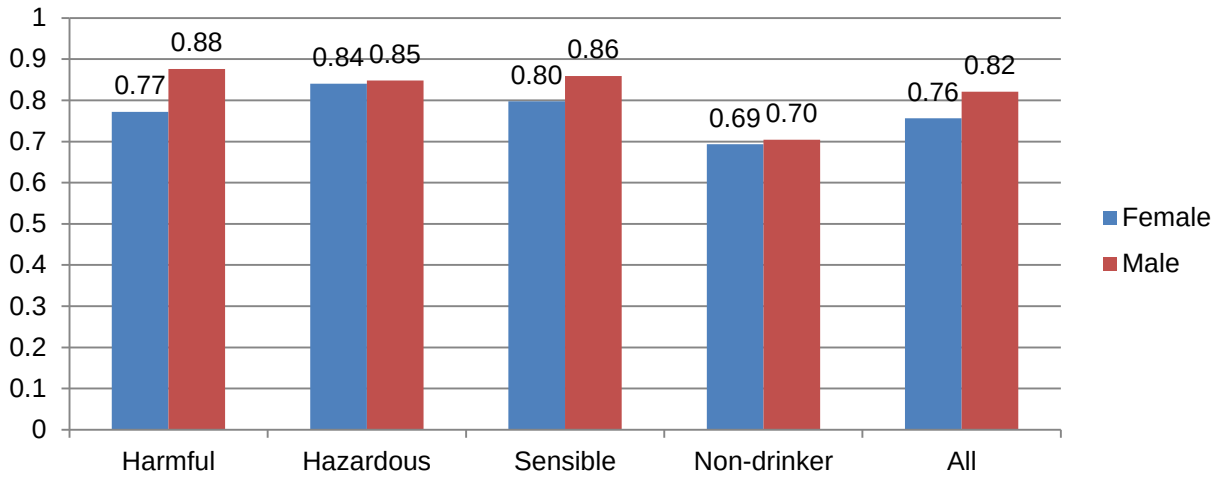
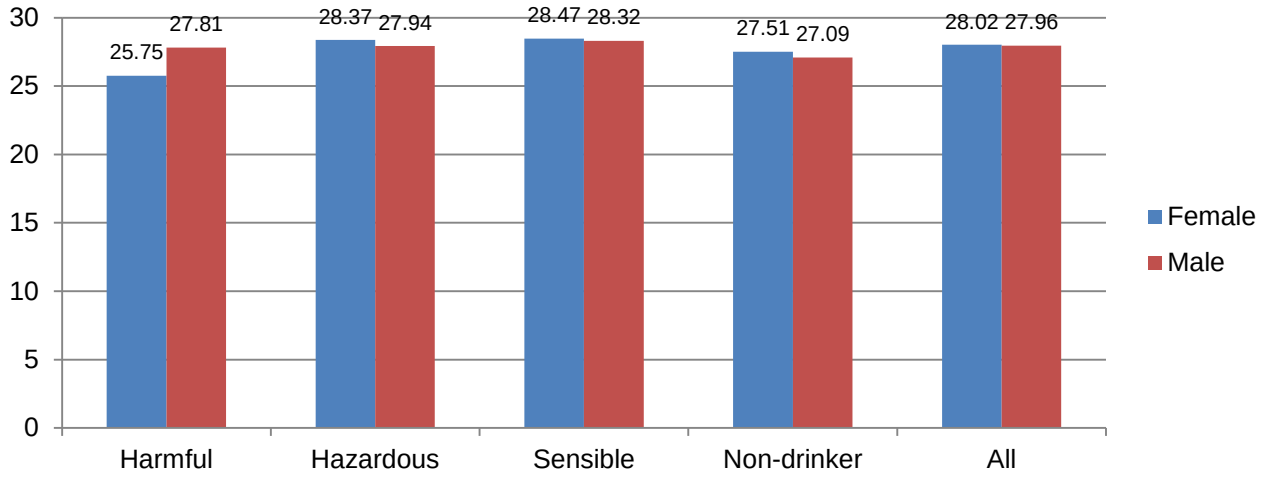
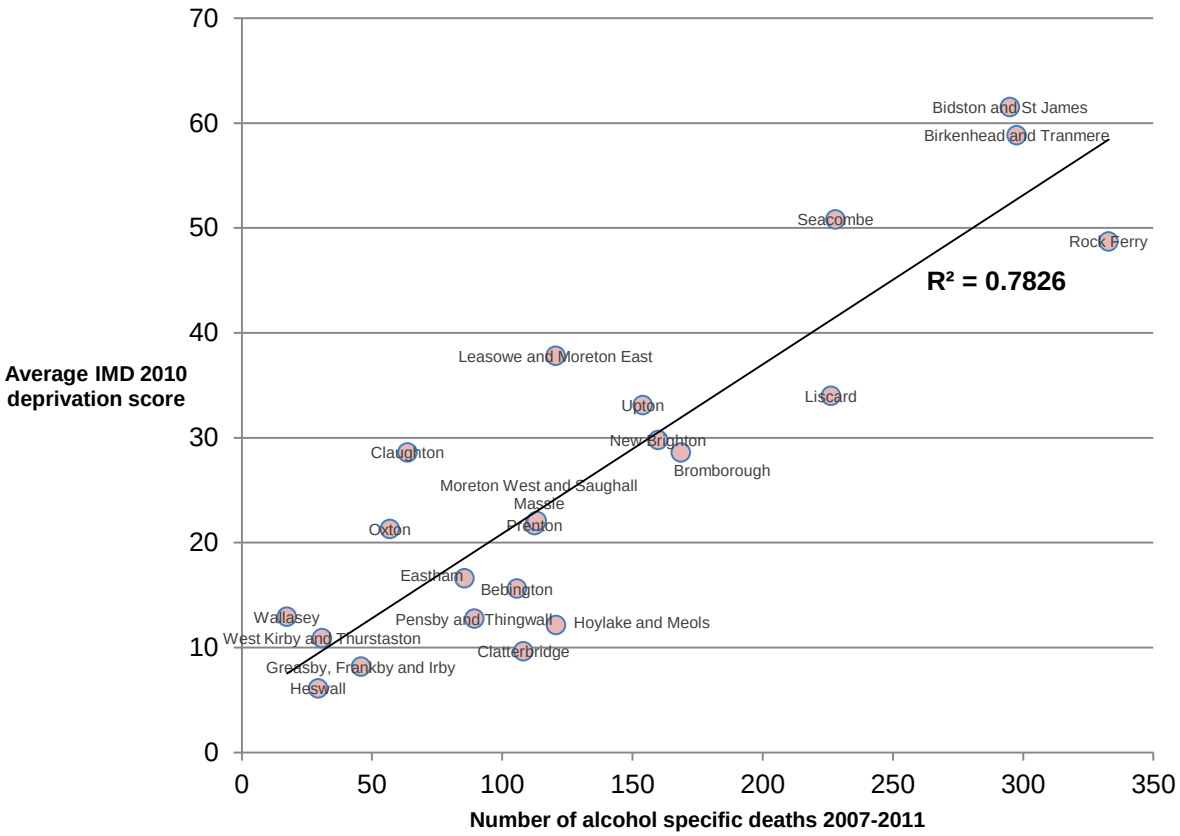


Figure 29. Subjective Wellbeing (SWEMWBS) scores from wellbeing survey 2009 by drinking category.



Nationally, deaths that were directly attributable to drugs and alcohol had fallen in men but increased in women from 2009 to 2011. For the five year time period 2007-2011 there were 314 deaths in Wirral from alcohol specific causes, an average of 63 per year (Beynon et al., 2013). Of these 67.5% were male and 32.5% were female with an average age at death of 53.and 88% of these alcohol related deaths being caused by liver disease. The Wirral ward areas with the highest numbers of deaths were those with the highest levels of social deprivation and alcohol-specific deaths correlated quite closely with deprivation, with an r^2 value of 0.783 (Figure 30).

Figure 30. Number of alcohol specific deaths vs. average IMD 2010 deprivation score for Wirral wards. Based on data from Beynon et al., 2013 matched with data from McClennan et al., 2011.



A report by the National Confidential Enquiry into Patient Outcome and Death (NCEPOD, 2013) found that many people who died from alcoholic liver disease were known to health agencies and opportunities had been missed to refer them to alcohol specialist services as three quarters had experienced a hospital admission in the 5 years before their death. In response the report recommended greater use of alcohol screening for all patients, including outpatients and A&E as well as those admitted to hospital. Alcohol as a risk factor was estimated to cause 121 deaths per year, and 3,291 years of life lost within Wirral (Möller et al., 2012). Within Wirral alcohol was estimated to be the fifth biggest cause of death, but the second biggest lifestyle-related cause of years of life lost, after smoking. This difference in effect is because alcohol causes more deaths at a younger age than other lifestyle risk factors. Alcohol was estimated to cause more than twice as many deaths in men than women.

Data from Wirral's Joint Strategic Needs Assessment (Highton, 2014) shows that 11% of crimes in Wirral were alcohol-related with a steep social gradient in crime rates between Birkenhead which had 160 alcohol-related crimes per 1000 population, to Clatterbridge which had 16 per 1000 population. The volume of alcohol-related violence decreased by

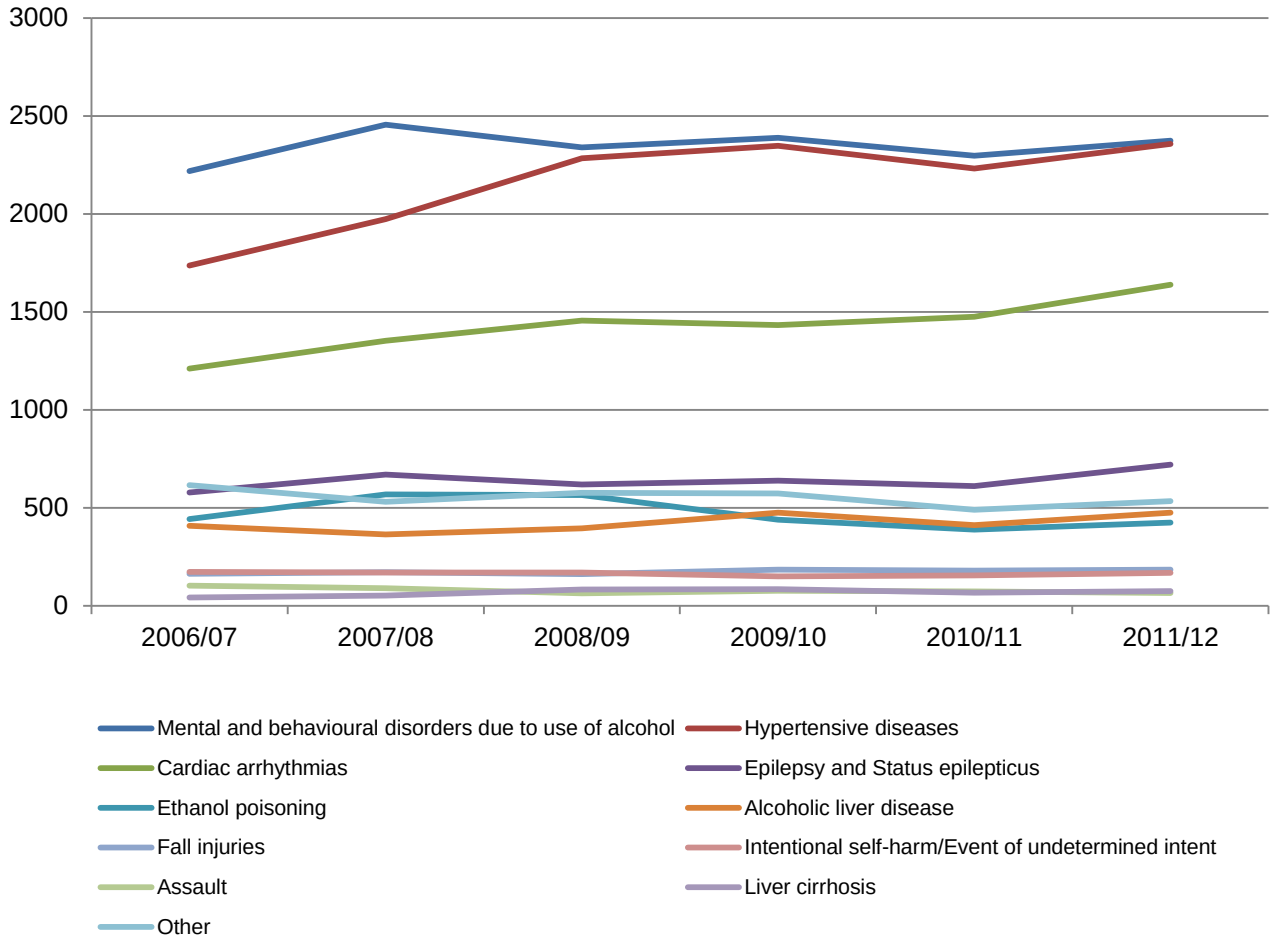
14.9% between 2008 and 2012 (from 687 to 608), however, the volume of alcohol-related domestic violence in Wirral increased by 14.9% over the same period (from 255 to 293 offences). Alcohol-related sexual crime increased by 290% (10 - 39 offences).

Alcohol-related hospital admissions are seen as a headline indicator is because they include admissions from across the population, from younger people who have drank too much and most often fallen over been involved in a fight, to people who been involved in traffic accidents, to older drinkers who have liver disease or alcohol related dementia from years of drinking. In this way alcohol admissions are seen as a useful barometer of how an area is progressing in tackling alcohol problems. In the last six years in Wirral, 1% of patients were responsible for 10% of alcohol related admissions, while 10% were responsible for 36% of alcohol related admissions with some patients having over 40 alcohol related admissions in a year. A multi-agency frequent attendees group tries to link frequent attendees into community services thus reducing their need to attend A&E.

Alcohol related admissions are calculated using an alcohol attributable fraction (AAF), which is the proportion of a disease code that is estimated to be caused by alcohol (Jones et al., 2008). This fraction varies by age and gender. So for 'Mental and behavioural disorders due to use of alcohol' the AAF is 1, that is the disease is completely caused by alcohol, whereas for males with hypertensive disease the average AAF is 0.27, so 27% of the disease is estimated to be related to alcohol intake whereas the rest is due to other causes, for example, genetic factors, smoking, and cholesterol. Therefore for every 100 admissions for hypertensive disease, 27 will be attributed to alcohol. For haemorrhagic stroke around 24% of admissions in males, but only 11% of admissions in females are recorded as being due to alcohol.

Figure 31 shows the trend for the top 10 causes of alcohol-related admissions in Wirral. Cardiac arrhythmias (AAF=0.28) and hypertensive diseases (AAF=0.19) have increased between 2006 and 2012, while admissions for mental & behavioural disorders due to alcohol (AAF=1) have stayed quite flat over the time period. So the message from this is that while admissions that are directly attributable to alcohol have not increased, admissions from common health problems that are partly attributable to alcohol have increased, and this may be partly due to the population in Wirral getting older on average. During 2010/11, nearly a quarter of all re-admissions to Arrowe Park Hospital in Wirral were attributable to alcohol.

Figure 31. Trend in alcohol related admissions in Wirral, sum of alcohol attributable fractions (AAFs), 2006/07 to 2011/12 financial year.



Source: SUS Hospital Admissions Data.

6.2 Alcohol – Available Interventions

Wirral's alcohol programmes were designed to cover the needs presented by the whole population, from giving advice to people about safe drinking limits, to helping people who are alcohol dependent and may also have severe mental health, criminal justice, social and drug problems. The main categories of alcohol services provided in Wirral were;

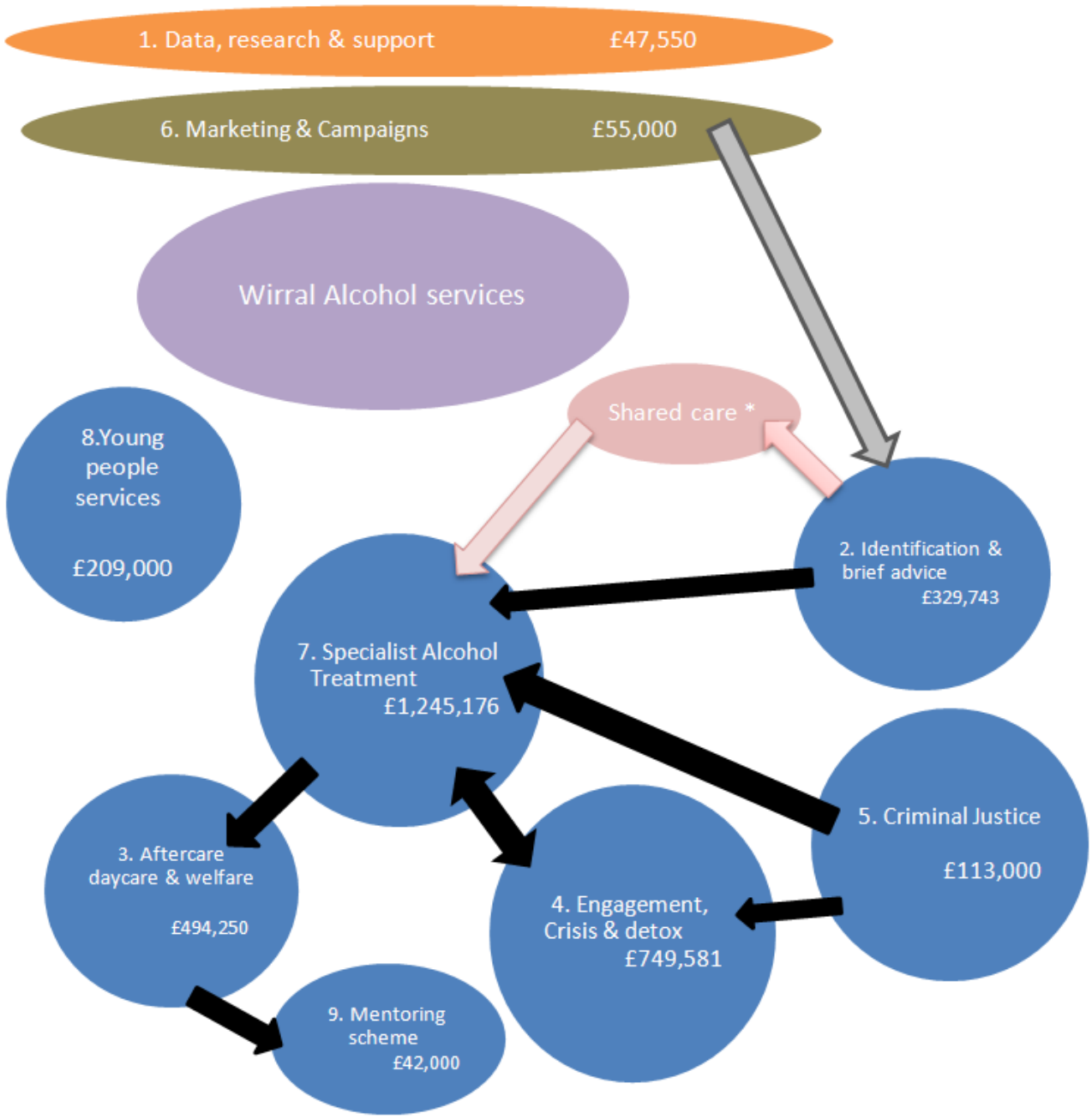
- Marketing & Prevention - often focussed on young people, these aim to prevent young people from drinking before they are 18, and from drinking to excess. Sometimes people who are arrested for relatively minor alcohol related offences such as urinating in the street are given a chance to attend an education session rather than accept a caution. There are local marketing campaigns such as 'Drink Aware' that aim to highlight the risks of drinking alcohol.

- Screening and brief intervention – known as identification and brief advice (IBA) - this is a population level intervention which identifies people who drink more than the recommended units in one session or per week and giving them brief advice to try to make them drink at a safer level. Individuals are categorised using the AUDIT (Alcohol Use Disorders Identification Tool) – developed by the World Health Organisation to screen patients in primary care settings for hazardous or harmful drinking (Allen et al., 2001). The AUDIT has a high level of sensitivity and specificity and can accurately predict future alcohol related-harm, including illness, hospitalization and social problems (Roche & Freeman, 2004). Brief advice usually includes as a minimum a discussion around the adverse impacts of drinking, the supply of a worksheet, and possibly the development of a drinking agreement. A brief intervention takes between 5 and 15 minutes, however some literature considers brief interventions to be made up of more than one session with the client. This is typically aimed at reducing alcohol problems in people who are not dependent but it may be that dependent drinkers are identified through this too.
- Services aimed at young people – including alcohol treatment, and services provided as part of health services in schools.
- Specialist alcohol interventions – this includes specialist alcohol treatment which uses a range of psychosocial interventions and motivational techniques. These are often structured psychosocial interventions where individuals have regular meetings with their caseworkers and work towards a set of goals which usually include safe drinking or abstinence from alcohol.
- Residential and community detoxification – this involves withdrawing an individual from alcohol and monitoring their health status, and often involves pharmacological interventions to reduce physiological withdrawal symptoms and reduce the risk of fits or tremors. There is also residential rehabilitation (rehab) where people spend a period of time, usually with other people who are recovering, to maintain their recovery from alcohol dependence in an environment where they are taken away from their environmental triggers which cause them to drink.
- Criminal justice interventions – this involves people who have been arrested with alcohol being a factor in their arrest. In 2010/11 services engaged with 991 people as part of the alcohol intervention project (AIP), delivering a total of 1,962 sessions. In this project people arrested for alcohol-related crimes are given brief interventions in the cell or referred into alcohol treatment. These clients were 85% male; 25% of clients had committed an alcohol related violent offence, 44% a criminal damage or alcohol related disorder offence, and 31% some other type of alcohol related offence.

- Aftercare & Recovery – these are services for people who no longer drink alcohol hazardously to try to keep individuals on the path of recovery, by providing training to increase their skills, and employment opportunities as well as kinship and social activities to keep them occupied.

Based on analysis by the author of data from PHE (2014b), in 2012/13 Wirral had 1,340 people in contact with structured alcohol treatment, a crude rate of 5.13 per 1000 population, which was the 10th highest out of 152 areas in England (the highest was Blackpool with a rate of 7.75 per 1000). The average rate for England was 2.5 people per 1000 population. In comparison with other parts of Merseyside, Wirral had a higher rate than Knowsley (ranked 12th), Halton (ranked 13th), Liverpool (ranked 16th), Sefton (ranked 24th), and St. Helens (ranked 53rd). This high rate indicates that Wirral has a high level of need for alcohol treatment and when compared with other areas, Wirral is being relatively successful in engaging with people and getting them into treatment. The rate for Wirral has fallen slightly over the last few years, partly because the estimated Wirral population which is the denominator for the rate has been adjusted upwards from around 305,000 to around 320,000 in light of the results of the 2011 census. Figure 32 shows the relationship between different categories of alcohol expenditure. Shared care features as part of the services provided by CWP (which is accounted for under specialist alcohol treatment). There is also a frequent attendees intervention, which comes from existing budgets. This is a monthly care planning meeting where people from the hospital, alcohol services, housing and other relevant partners discuss clients who have been frequent attendees in hospital. There are other groups such as Alcoholics Anonymous which are voluntary groups that do not receive funding but play a part in helping people in recovery and stopping them from relapsing into alcohol problems.

Figure 32. Spend on different elements of alcohol programme, shown with relationships between services.



Based on the UK Department of Health's alcohol needs assessment, 10% of dependent drinkers accessing treatment is considered a low level of access, while 15% is considered a medium level and 20% a high level of access (DH, 2005). Assuming that everyone in treatment is a dependent drinker, then in 2012/13 Wirral had an access level of 11.3%. The target number in treatment for Wirral of 1,777 equates to 15.1%. Using these criteria, to have a high level of access Wirral would need to have 2,352 people in treatment. It is important to note that there is a lot of uncertainty around the actual number of dependent drinkers in Wirral, so for instance the estimates for higher risk drinkers in Wirral (of which dependent

drinkers are a subset) have a 95% confidence interval of being between 2.3% and 20.5%, or between 1 in 40 of the population and 1 in 5 of the population. This would mean that the numbers in treatment needed to represent a high level of access could be anywhere between around 1,000 and 10,000 people. Looking at the ratio of high risk drinkers to people in treatment, the average for England is around 5.0% of high risk drinkers being in treatment, whereas for Wirral the figure is 9.6%, so this indicates that Wirral is performing quite well in getting people into treatment.

Table 23. Numbers of people in alcohol treatment needed to achieve low, medium and high levels of access in Wirral.

	Number	**% of dependent drinkers**
Estimated number of dependent drinkers (2008)	11,760	100
Number needed for low level of access	1,176	10
Number needed for medium level of access	1,764	15
Number needed for high level of access	2,352	20
Target Numbers in treatment (2012/13)	1,777	15.1
Actual Numbers in treatment (2012/13)	1,334	11.3

Because many clients have concomitant drug and alcohol problems, it can be difficult to disaggregate some of the expenditure by client group particularly because many clients also have mental health problems (17% of opioid users in Wirral were also hazardous drinkers). The estimated total spent on alcohol interventions for Wirral in 2011/12 was around £3.3million. Wirral ranked 31st highest out of 151 PCT areas for spend on substance misuse in 2011/12.

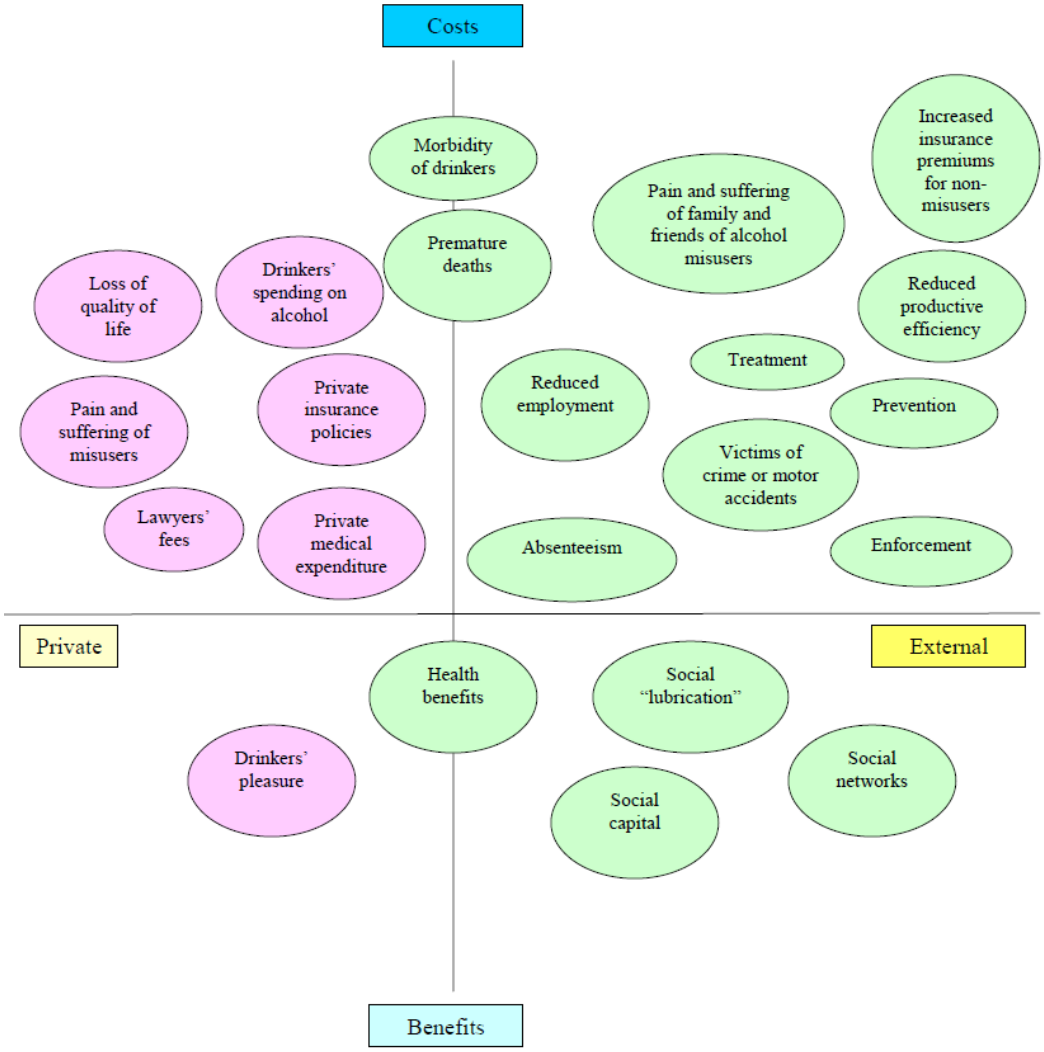
The services considered in this case study are the main specialist alcohol treatment service, and the residential detoxification services, these were chosen because together they make up the bulk of the alcohol spend in Wirral at around £2m per annum, and because they had the most rich client-level data.

6.3 Background to Case Study

Throughout Europe, it has been estimated that the social costs of alcohol are between 1% and 3% of GDP (Klingemann & Gmel, 2001). Within the UK it has been estimated (Leontaridi, 2003) that alcohol misuse costs the health service £1.7 billion per year (2001 prices), while the costs associated with alcohol-related crime and anti-social behaviour were estimated at £7.3 billion, workplace costs of alcohol misuse were estimated at £6.4 billion per year through loss in productivity. Deaths from alcohol-related causes doubled in the 15 years between 1992 and 2006 largely caused by an increase is deaths from alcoholic liver disease, which rose by 36% between 2001 and 2008. This increase in liver disease imposes significant costs on the health service with liver transplants costing between £60,000 and £80,000 per patient (van der Hilst et al., 2008).

An update to the 2003 report *(DH, 2008)* estimated that the cost of alcohol harm to the NHS in England had risen to £2.7 billion in 2006/07 prices. The Government's alcohol strategy (2012) estimated the total societal cost of alcohol (health, social problems, criminal justice and lost productivity costs) at £21billion, which without weighting the cost for deprivation would equated to a cost of £127million when applied to the population of Wirral (see Figure 33).

Figure 33. Diagram showing costs and benefits associated with alcohol (taken from Leontaridi, 2003).



The European Alcohol Strategy (adopted in 2006) outlined how alcohol was a cause of 7.4% of ill health and death in the EU, and particularly a cause of death in younger people, with alcohol also being implicated in one in four traffic accidents in the EU.

In 2009 the World Health Organisation (WHO) produced Guidance on Action to Reduce Alcohol-Related Harm which had objectives around monitoring and disseminating evidence around alcohol harm and around partnership working. WHO (2009) estimate that alcohol misuse causes a greater number of disability adjusted life years (DALYs) lost globally than tobacco (see Figure 6), although these are skewed more towards middle- than high-income countries like the UK.

The Government's alcohol strategy (HM Government, 2012b) included policy measures such as considering a minimum unit price for alcohol in England and Wales, as well as increasing alcohol duty at 2% above retail inflation and changing the duty charged on ciders and beers to reflect their strengths. It encouraged greater use of brief interventions, specialised treatment for people dependent on alcohol, the use of alcohol liaison nurses within A&E and the inclusion of alcohol consumption as part of NHS health checks. The strategy provided greater powers for local areas to regulate the number of licensed premises in an area.

Alcohol is big area of spend for Wirral and for public health teams in general, therefore is it important to determine whether services are cost effective. This case study did not cover all alcohol services provided within Wirral but concentrated on evaluating the cost effectiveness of alcohol identification and brief advice (IBA), alcohol treatment, including shared care, and residential detoxification. The aims and outcomes of the different services will vary unlike in smoking where services largely had a similar objective - a reduction in smoking behaviour. The analyses for alcohol services aimed to measure the impact of excessive drinking on the quality of life experienced by 'problem' drinkers. By evaluating quality of life using the EQ-5D outcome measure the outcome analysis could be framed in a cost-utility framework allowing calculations to be made of the cost per QALY (quality adjusted life year) derived for each service. All of the interventions analysed were essentially compared to a 'do nothing' alternative in which drinking behaviour was assumed to continue unaltered. A previous, mainly qualitative, evaluation (ciResearch, 2010) recommended that Wirral alcohol service reviewed their strategies for engaging with clients to maximise attendance. The research highlighted the existence of tensions within Wirral between medical and social approaches to therapy. This research also called for a greater degree of clarity around pathways of care. It was acknowledged that there existed a lot of choice with regard to patient pathways but that this heterogeneity of service provision meant that it could be hard for clients to navigate their way through the system. Services were generally well coordinated and successes in targeting services to 'hard to reach' clients such as homeless and street drinkers and people in criminal justice settings. However services needed to be better joined up, particularly between criminal justice settings and treatment.

6.4 Case Study

6.4.1 Aim

The aim of this case study was determine whether alcohol treatment interventions were successful in improving the health and wellbeing of individuals in treatment. In addition, the aim was to demonstrate how these economic modelling techniques and realist evaluation methodologies could be used to create a narrative that described the effectiveness of the interventions and the complex system in which they were embedded.

6.4.2 Literature review

A lot of evidence of what works for alcohol comes from US studies which are not always generalizable to UK settings, because the US has a different drinking culture, and because the most common models of alcohol treatment in the US are around achieving complete abstinence from alcohol whereas in the UK this is not always seen as the most important element of alcohol treatment.

Despite alcohol interventions requiring a large proportion of public sector spending, there are comparatively few economic studies looking at the cost effectiveness of alcohol interventions. One reason for this lack of economic evidence may be that alcohol costs and outcomes fall across many different sectors, which greatly enhances the complexity of any analysis undertaken. Much information is self-reported and therefore may not be reliable as individuals may be unwilling to admit to any excesses in their drinking behaviour. Ideally a study would be able to match data from many different sources to accurately establish the client's journey and any costs incurred across several sectors.

Matrix and Health England's 2008 research study (Matrix evidence & Bazian, 2008) around prioritisation for public health interventions examined various preventative health interventions, including alcohol brief interventions. They estimated, with strong certainty, the cost per QALY gained for alcohol brief intervention as being £4,507. They also estimated that in the longer term these interventions would be cost effective, and would potentially reduce health inequalities as problem drinking was 1.78 times more prevalent among routine and manual groups than the population as a whole. This cost per QALY ratio would be considered to be cost effective when compared to the NICE threshold of £20,000-£30,000 per QALY gained. Matrix estimated that the total cost of rolling out this intervention nationally would be between £100million and £1billion, which is roughly between 0.1% and 1% of the total health budget for England.

An economic model estimated that a strategy of opportunistic screening and brief intervention would be cost saving to the NHS in the long term, with the optimum strategy being opportunistic screening i.e. screening at next GP consultation, followed by a five minute brief intervention carried out by the GP (Jackson et al., 2010). Increasing the number of people screened might only be of value if resources were available to provide more high intensity interventions, where screening indicates this to be necessary. The IBA data for Wirral indicated that only 0.2% of people screened are referred on to more intensive alcohol services. A tool created by the Department of Health's National Support Team for health inequalities used data on mortality rates in heavy drinkers to estimate the impact of brief intervention on mortality rates (Cuijpers et al., 2004). For brief interventions the number needed to treat (NNT) to prevent one death was 402. So for Wirral, carrying out 5,596 brief interventions was estimated to prevent 14 deaths.

A series of Value for Money Tools have been developed by the National Social Marketing Centre (NSMC) with a health economist, Professor Graham Lister, and data from NICE (Lister & Merritt, 2013). These allow local agencies to model the impact of public health interventions, including alcohol identification and brief advice.

Table 24 shows the results from the NSMC Value for Money tool when applied to Wirral. The population gain from 19,332 brief interventions is estimated to be 90.5 QALYs based on the average QALY gained from an opportunistic 5 minute GP brief intervention which is estimated to produce a 0.5% change in individuals from heavy to moderate drinking after one year. The cost per QALY before is £3,644 which is similar to the estimate in Matrix' study of £4,507 per QALY gained and similar to previous work carried out for Wirral which estimated a cost per QALY of £3,609 (not published). Overall the intervention is estimated to be cost saving to the NHS, with an investment of £329,743 producing a long term discounted net cost saving of £506,937 to the NHS.

Table 24. Results from NSMC Value for Money Tool, based on Wirral activity for 2011/12 financial year and a 0.5% shift from heavy to moderate drinking.

Results	Health Impact QALY	Public Sector Services Cost	Net Cost to Public sector	Net cost Per Health Gain £/QALY
Outcomes	90.49		£329,743	£3,644 (between £2,280
Cost Savings to NHS from Health Gain		£836,680	-£506,937 (i.e. Cost saving)	Cost saving
Cost savings to Police and Other Criminal		£216,754	-£810,978 (i.e. Cost saving)	Cost saving
Cost savings to Social Care		£87,287		
Hospital Admissions averted (over the long	112.73 (between			
Total Deaths Averted	2.29 (between 2.06 and 2.52)			
Total Years of Life Added	26.10 (between 23.5 and 28.7)			

One of the biggest UK economic studies of alcohol treatment was the UKATT trial (UKATT Research Team, 2005) which compared Motivational Enhancement Therapy (MET) with what was then a new technique, Social Behaviour and Network Therapy, (SBNT) in terms of their relative cost effectiveness. The study showed that SBNT was more cost-saving and less effective than MET but these differences were not statistically significant. NICE estimate that relapse rates for people in alcohol treatment are around 82-90% which is very high. In general the economic costs used in economic evaluations of alcohol services are lower than those in cost of illness studies, as an economic evaluation will assess alcohol-related crime in individuals in treatment while a cost of illness study will look at the proportion of crime that is alcohol-related. This is important from a policy perspective as it may imply that economic evaluations provide an underestimate of societal cost effectiveness (van Gils et al., 2010). A report (NTA, 2006) found that for every £1 spent on treatment, £5 is saved elsewhere (Heather et al., 2006). The Department of Health's Guidance for Commissioners (2009) said that commissioning interventions for dependent drinkers in the average PCT (population 350,000) – for every £583,464 invested, there would be a saving of £1,808,737 in return on the investment. This 3:1 ratio would equate to a saving of £6.8million from Wirral's

investment of £2.2million. It also stated that for every additional £1m invested in alcohol interventions, 1,200 alcohol-related hospital admissions could be avoided. This report stated that interventions based on cognitive behavioural approaches have the best chance of success.

6.4.3 Data sources

Data was received from Wirral specialist alcohol treatment service and from the residential detoxification centre at Birchwood. This was provided in the form of Excel spreadsheets which had a line listing where each line represented one client who had used the service. For Birchwood residential detox data was provided for 673 admissions for 562 unique clients admitted in 2010/11 and 2011/12 financial years. For specialist alcohol treatment services, the data covered 1,234 clients referred in 2011/12 financial year. The data definitions are outlined in *Appendix 5. Drug & Alcohol Treatment Data Definitions.*

The models were also populated with some data from the evidence where the data from the services was not sufficient to estimate outcome or probability parameters, or to estimate long term outcomes from short term surrogate outcomes.

6.4.5 Methods

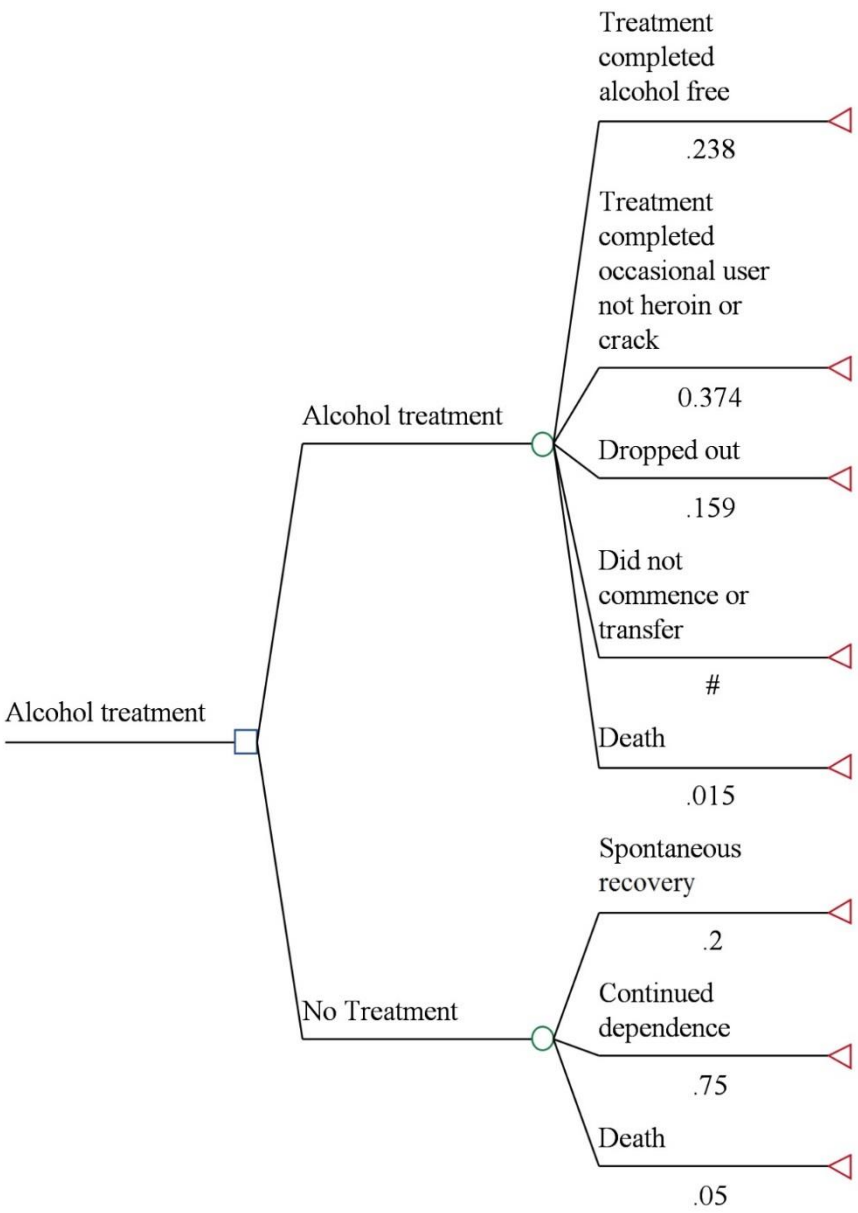
Alcohol Treatment Services – Economic Modelling Methods

The economic model was constructed by the author. For the main alcohol treatment services, an economic model was constructed to assess the clinical and cost effectiveness of services within Wirral in comparison to a 'watchful waiting' (i.e. no treatment) comparator. This model evaluated health outcomes over a one year period and was primarily based on data derived from the service. The input parameters for the decision tree model developed are shown in Table 25. Quality of life scores derived from the TOPs (Marsden et al., 2008) were used as a proxy for utility so for instance if the average score was 14 out of 20 then this would correspond to a utility score of 0.7. This has limitations in validity but has a strength in that it is based on actual data from individuals in the service. The model structure is shown in Figure 34.

Table 25. Model parameters for one year alcohol treatment model.

Parameter	Value	Standard deviation for PSA	Probability distribution for PSA	Source
Utility (dependent drinker)	0.498	0.265	Beta	Baseline TOPs quality of life (QoL) score from service data
Utility (occasional drinker)	0.701	0.224	Beta	Follow up TOPs QoL score from service data
Utility (alcohol free)	0.786	0.195	Beta	Follow up TOPs QoL score from service data
Cost of no treatment	not included			
Cost of treatment	£1,123	£229	Gamma	Wirral finance data
Spontaneous recovery rate	0.2	not included	not included	Walters (2000)
Recovery rate treatment (moving to occasional drinker)	0.374	not included	not included	
Recovery rate treatment (moving to alcohol free)	0.238	not included	not included	
Mortality rate (no treatment)	0.05	not included	not included	Barbosa (2010)
Mortality rate (treatment)	0.015	not included	not included	Service data
Time horizon	1 year	not applicable	not applicable	
Discount rate	None as only 1 year time horizon	not applicable	not applicable	

Figure 34. Structure of alcohol treatment decision tree model. # = the remainder of the probabilities on each branch.



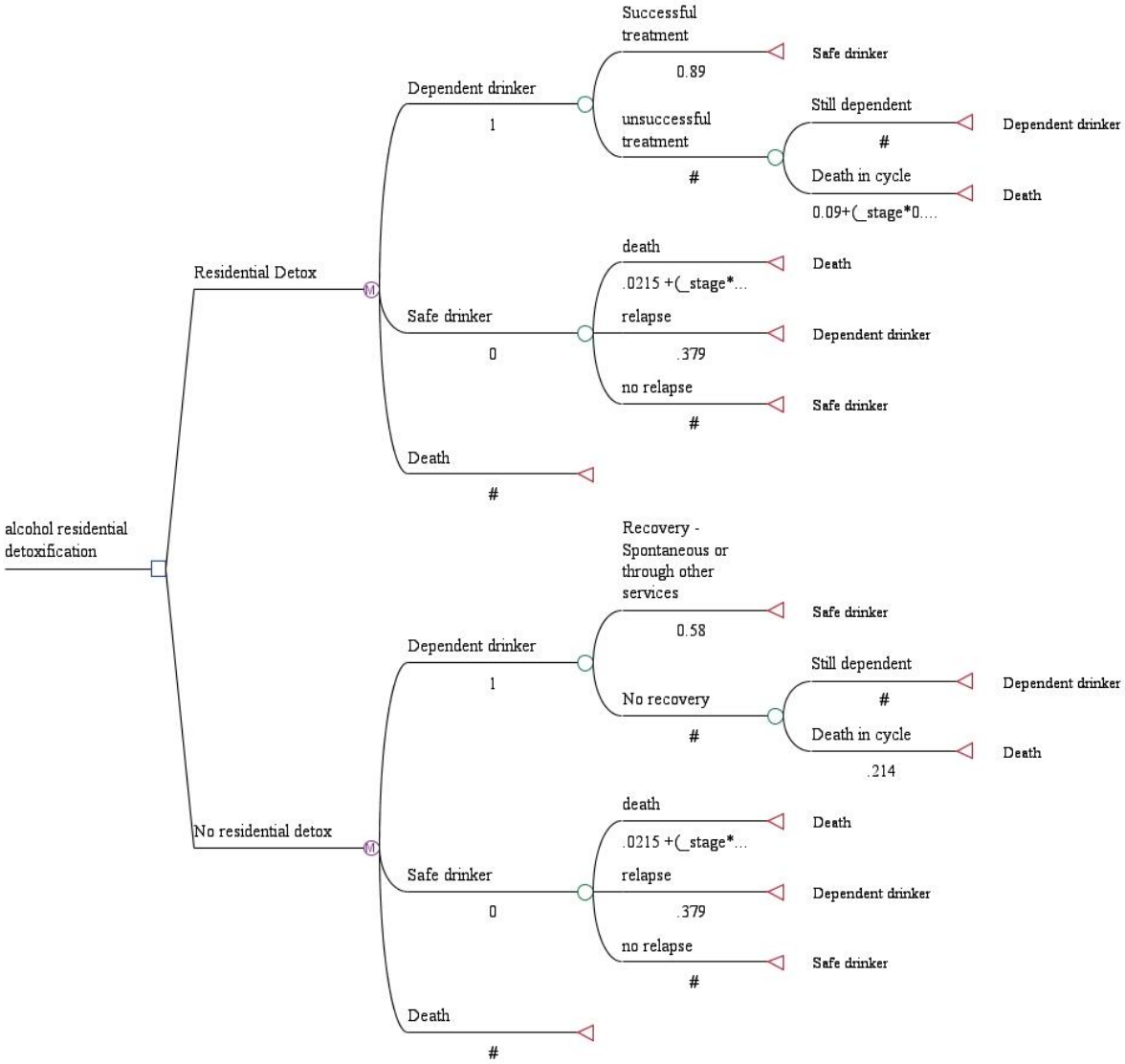
Alcohol Residential Detoxification - Economic Modelling Methods

The economic model was constructed by the author. The Birchwood residential detoxification data was used to create a Markov chain model to estimate the cost effectiveness of residential detoxification at Birchwood compared with standard non-residential care. The main input parameters of this model are provided in Table 26.

Table 26. Parameters for economic model for alcohol residential detoxification.

Parameter	Value	Standard deviation for PSA	Probability distribution for PSA	Notes
Successful treatment	0.89	0.02	normal	Based on Birchwood service data
Relapse rate 5 years	0.85	not included	not included	Based on NICE Guidance CG115
Relapse rate 1 years	0.379	0.06	normal	Based on 5 year rate from CG115 (SD based on SD for succcessful treatment)
Spontaneous recovery rate or recovery rate in other alcohol services	0.58	0.08	normal	Based on treatment complete in alcohol services for Wirral
QALY Utility score (dependent drinker)	0.6349	0.299	normal	Based on harmful drinker from UKATT trial (UKATT Research Team, 2005)
QALY Utility score (safe drinker)	0.8	0.26	normal	Based on normal EQ-5D UK utility age 50-60
Upfront cost of residential detoxification	£946	£95	gamma	Based on Wirral finance data
Additional healthcare cost per year (dependent drinker)	£1,800	£180	gamma	Based on NICE Guidance CG115, assumed to include readmission to residential detoxification
Mortality rate (dependent drinker)	0.09 +(0.01 per year)	not included	not included	Based on Barbosa (2010)
Mortality rate (ex-dependent drinker)	0.0215 +(0.01 per year)	not included	not included	Based on Barbosa (2010)
Discount Rate	3.5% Per annum	not included	not included	This is the UK standard discount rate from the Treasury green book.
Time horizon	50 years	not applicable	not applicable	This was a time horizon by the end of which almost all of the cohort in the model will have died.

Figure 35. Structure of Markov economic model for alcohol residential detoxification. # = 1 minus sum of other probabilities.



The Markov model for residential detoxification assumed that a person exists in one of a set of mutually exclusive states - dependent drinker, safe drinker, and death. Each person has a probability of moving from one state to another for every year over the 50 year time horizon of the model-in effect a lifetime analysis as after this period nearly all clients would be dead. All people in the model started off as dependent drinkers, then in each cycle they would either remain as dependent drinkers, move to being 'safe drinkers', (this includes people who are abstinent), or would die. Costs and outcomes which occurred in the future were discounted at 3.5% per annum. Going through residential detoxification is assumed to reduce an individual's chance of spending the following year as a dependent drinker, but the high relapse rate would mean that people would have a high chance of moving between

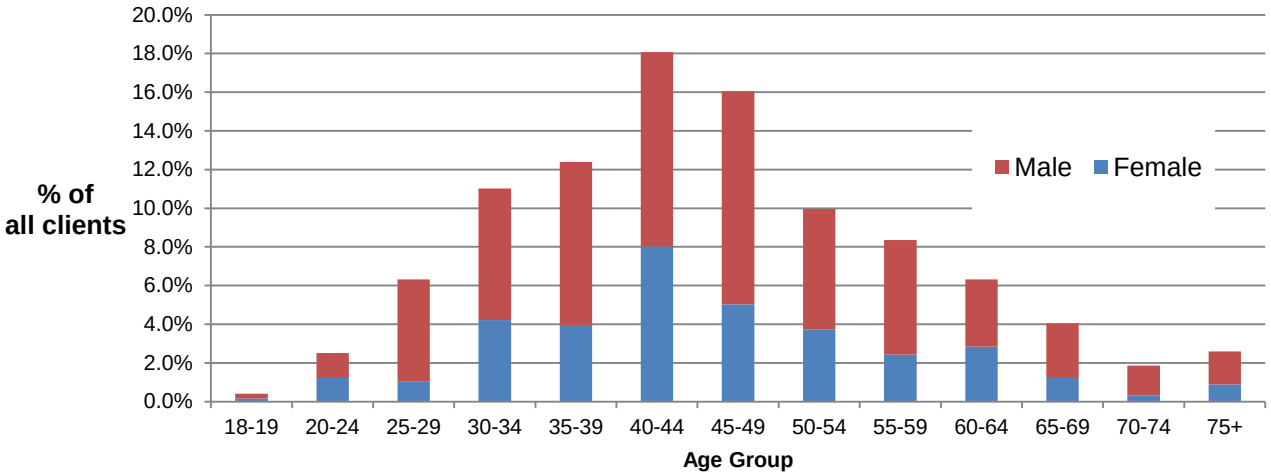
groups. This makes intuitive sense as we know from the evidence that people with alcohol problems often go through several cycles of relapse and recovery.

6.4.6 Results

Specialist Alcohol Treatment Services – Economic Model Results

Specialist alcohol treatment services in Wirral included pharmacological interventions, motivational interventions, cognitive behavioural therapy and psychosocial interventions. The data provided covered referrals from April 2011 to January 2013 and included 1890 unique clients, and 2304 referrals in total. Self-referrals had a slightly higher completion rate which may indicate that these individuals are better motivated to change on average than individuals that have been referred by other parties. Overall men made up around two thirds of clients and the biggest age group was between 40 and 50 (Figure 36). Compared to national treatment data, Wirral has a greater proportion of clients aged 60 and over, and a lower proportion of clients aged under 25.

Figure 36. Proportion of specialist alcohol treatment clients by age and gender, 2011/12 FY.



Programme completion rates were similar for males and females. In terms of age, 20-24 year olds had the lowest completion rates, while there seemed to be two distinct groups, with completion rates around 56-58% for 25-50 year olds then 64-67% for 50-70 year olds. Overall alcohol completion rates were similar to national rates (57% for 2011/12).

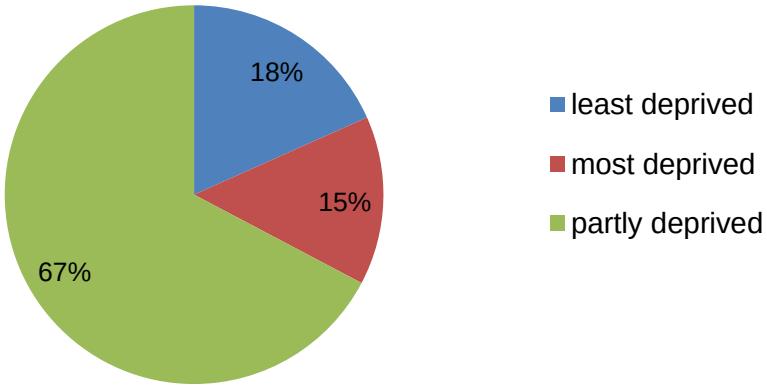
Table 27. Proportion of specialist alcohol treatment clients completing the treatment programme by age and gender, 2011/12 FY.

Age group	Female	Male	Total

18-19	100%	33%	60%
20-24	27%	38%	32%
25-29	46%	58%	56%
30-34	56%	54%	54%
35-39	59%	56%	57%
40-44	58%	58%	58%
45-49	58%	55%	56%
50-54	72%	64%	67%
55-59	53%	68%	64%
60-64	63%	70%	67%
65-69	60%	69%	66%
70-74	75%	47%	52%
75+	64%	43%	50%
Total	59%	58%	58%

The majority of clients with AUDIT scores were identified as being either dependent (77% of clients) or higher risk drinkers (4%). The proportion of clients in each severity category did not differ significantly by age or gender. Clients did not have full postcodes so could not be accurately matched to deprivation groups. However based on the partial postcodes it is estimated that just over half of clients were from the 20% most deprived areas nationally (which contain 32% of the Wirral population). This indicates that people in the more deprived areas are more likely to be in alcohol treatment (Figure 37).

Figure 37. Proportion of specialist alcohol treatment clients by deprivation category, 2011/12.



Employment status was recorded for 17.3% of clients. Of these, the majority were unemployed. There were 46 clients who were recorded as being in employment.

Table 28 shows the number of clients by type of intervention and proportion that had completed treatment as of January 2013. The most common treatment modality was other structured intervention followed by psychosocial interventions and brief interventions. 16.2% of clients (200 clients) were recorded as being under shared care. Most clients (83%) had one treatment modality, although 6.7% of clients had 2 or more modalities recorded.

Table 28. Number of clients by type of intervention & setting with proportion having treatment completed as of January 2013, 2011/12 FY. Specialist alcohol treatment clients

Intervention	Number of clients	% of referrals	Treatment completed %	Average N contacts per client	Average days in treatment
Brief intervention	238	19.3%	55.9%	2.7	24
Prescribing	13	1.1%	30.8%	32.4	174
Other structured	887	71.9%	65.5%	8.3	94
Pharmacological intervention	5	0.4%	20.0%	17.2	300
Psychosocial intervention	51	4.1%	19.6%	26.0	335
Recovery support	3	0.2%	0.0%	28.7	
All interventions	1,109	89.9%	58.3%	7.5	73
Shared Care	200	16.2%	50.5%	10.0	91

Clients with dual diagnosis (meaning a concurrent mental health problem as well as alcohol dependence) were, perhaps surprisingly, slightly more likely to complete treatment than those without; 64.5% of dual diagnosis clients from 2011/12 completed treatment. Clients with concurrent other drug problems were much less likely to complete treatment however, with only 20.0% of clients completing treatment. So from a realist evaluation point of view, having concurrent drugs problems is a context that makes people less likely to successfully complete alcohol treatment.

Treatment Outcome Profiles (TOPs) are outcome tools that were developed by the NTA (National Treatment Agency) in England (Marsden et al., 2008). These are typically collected for drug users in treatment, but are collected for people in alcohol treatment too. There has previously been a UK target around 85% people in drug treatment having TOPs completed, but no equivalent target for alcohol. In alcohol treatment there is not a current consensus around which outcome measures are most important. For clients with before and after TOPs, there was a statistically significant improvement in all of the outcome measures; drinking days reduced by 64%, daily units reduced by 74%, self-assessed physical health increased by 38%, psychological health by 51%, and quality of life increased by 52%. Unfortunately there does not seem to be a current gold standard for converting TOPs to a summary utility score like that derived from the EQ-5D which is the current gold standard questionnaire for calculating QALYs. Because before and after TOPs was only recorded for around a quarter of clients, it is not clear whether these are representative of the rest of clients or may just represent the success stories, with other clients having dropped out or not benefitted as much from treatment. Most importantly, because TOPs is self-reported there is a lot of uncertainty around reliability, as clients may be trying to meet the expectations of service providers, and in the case of drug treatment clients often have other outcomes contingent on this, so for instance would not admit to continuing heroin use if they are receiving methadone. Table 29 shows changes in TOPs outcomes for specialist alcohol treatment clients in Wirral. For this analysis 95% trimmed averages are provided because some extreme values skewed the data.

Table 29. Specialist alcohol treatment clients. TOPs outcomes as of January 2013, 2011/12 FY. 95% Trimmed averages.

Outcome	Initial	Discharge	Most recent (where most recent is not initial or discharge)
Number with TOPs recorded	839 (76%)	276 (25%)	104
Alcohol drinking days (per 28 days)	20.3	7.4	14.3
Average daily units	25.0	6.4	12.9
Estimated weekly units	126.9	11.7	45.9
Average physical health status	10.4	14.4	11.3
Average psychological health status	9.6	14.6	11.0
Average Quality of Life	10.0	15.1	11.9

The most common treatment outcome was treatment completed – occasional user, which indicates that not all clients become completely abstinent from alcohol. The definitions of completing treatment come from the service rather from the clients so it may be that some clients who drop out have actually conquered their alcohol problems themselves but do not feel they want to have continuing contact with the service.

Table 30. Treatment outcomes for Specialist alcohol treatment clients, 2011/12.

Treatment Outcome	**N**	**% of total**
Treatment completed - occasional user (not heroin or crack)	430	37.4%
Treatment completed - alcohol-free	283	23.2%
Incomplete - dropped out	202	15.9%
Incomplete - treatment commencement declined by client	135	10.0%
Treatment Declined by Client	56	4.1%
(blank)	48	3.7%
Did Not Attend Any Appointment	19	1.2%
Incomplete - Client Died	15	1.3%
Transferred - in custody	15	1.0%
Other	31	2.2%
Total	1234	100.0%

There were 1,109 clients who were recorded as having alcohol interventions in 2011/12. The total spent on CWP specialist alcohol treatment services for 2011/12 was £1,245,176 which works out as £1,123 per client or £153 per contact. The cost per completer was £1,729. Many clients will use several services i.e. detoxification, aftercare etc., and it is not possible to match up all clients across the patient journey with current data so the total average cost per client will be higher than this.

The deterministic model estimated that over a one year period people in alcohol treatment programmes experienced on average 0.13 QALYs more in comparison to those not in treatment programmes. Applying this average to the total number of patients referred to CWP in 2011/12 equates to an estimated additional 160.42 QALYs gained in this population. Given the total cost of service provision (£1,245,176) this provides an estimated cost per QALY of £7,761. Such a figure can be interpreted as being highly cost effective when compared to the quoted willingness to pay threshold used by NICE of £20,000 to £30,000 per QALY gained (Rawlins et al., 2010). This model represents a short term approximation of the costs and benefits that would be likely to arise from effective multi agency interventions to reduce alcohol abuse. The development of the model is continuing to improve the data sources and to extend the time line with a view to enhancing the accuracy of the analysis undertaken. If the perspective of the analysis was widened to take into a broader perspective then the service may produce a greater return on investment through reduced crime, antisocial behaviour and indirect health and social care spending.

Probabilistic Sensitivity Analysis – Alcohol Treatment

A probabilistic sensitivity analysis (PSA) was carried out to see how sensitive the model results were to uncertainties in the input parameters. Because the model included costs of treatment only, the net costs were always positive. Figure 38 shows a scatterplot of 10,000 iterations of the model where each iteration was drawn randomly from the probability density functions. It is clear that for most iterations, the benefits are positive, but for some the benefits are negative. Figure 39 shows the cost effectiveness acceptability curve (CEAC) which shows that alcohol treatment has a probability of 53% of being cost effective where willingness to pay is £10,000 per QALY gained, and a probability of 69% at £20,000 per QALY gained. Overall the results of the PSA indicate some uncertainty around the cost effectiveness of the service based on this model. In a set of 1-way sensitivity analyses shown in a tornado diagram, the net mean benefit based on a willingness to pay of £30,000 per QALY was particularly sensitive to uncertainty around the utility values, and less sensitive to uncertainty around the cost per client (Figure 40).

Table 31. Results of probabilistic economic model with 95% confidence intervals.

	One year horizon	
	Treatment	No treatment
Total cost (CI)	£1,266,368 (£817,469-£1,817,375)	0 (0-0)
Total QALYs (CI)	0.64 (0.36-89)	0.52 (0.16-0.87)
Cost per patient (CI)	£1,149 (£737-£1,639)	0 (0-0)
Cost per completer (CI)	£1,776 (£1,147-£2,549)	0(0-0)
Cost per QALY (CI)	£9,301 (£1,261-£29,774)	

Figure 38. Specialist alcohol treatment model, iterations of incremental cost effectiveness, with ellipse showing 95% prediction intervals.

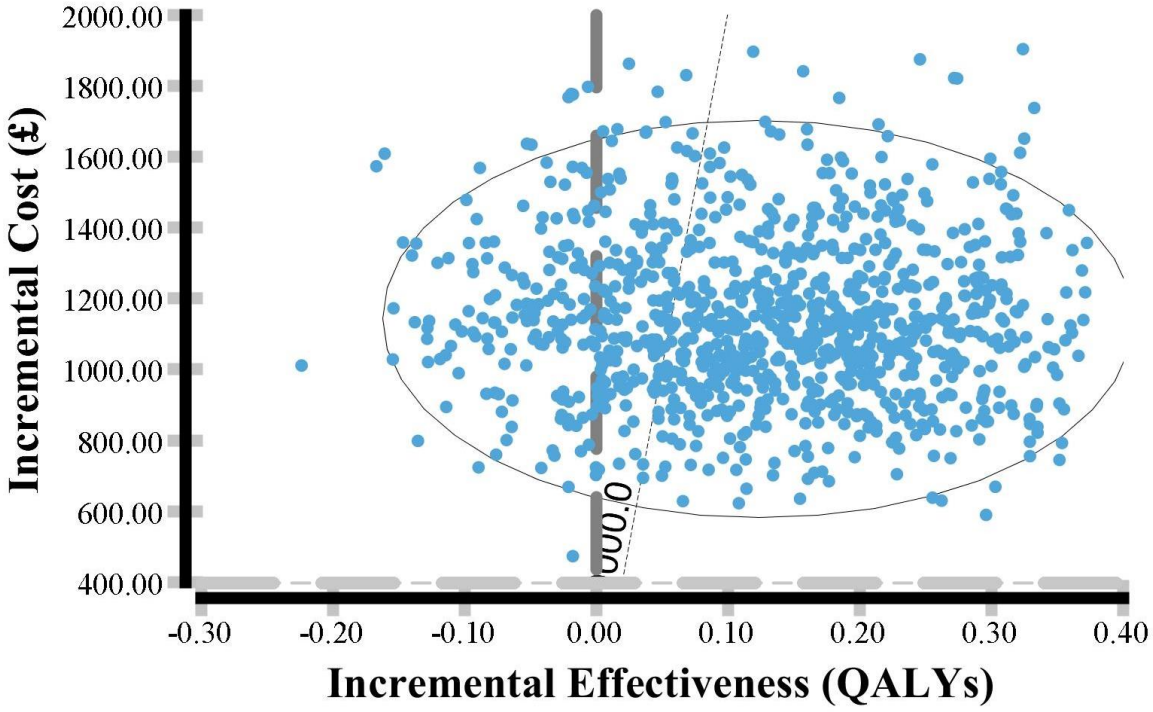


Figure 39. Cost effectiveness acceptability curve, alcohol specialist treatment showing probability of alcohol treatment being cost effective vs probability of no treatment being cost effective at different values of willingness to pay for one QALY.

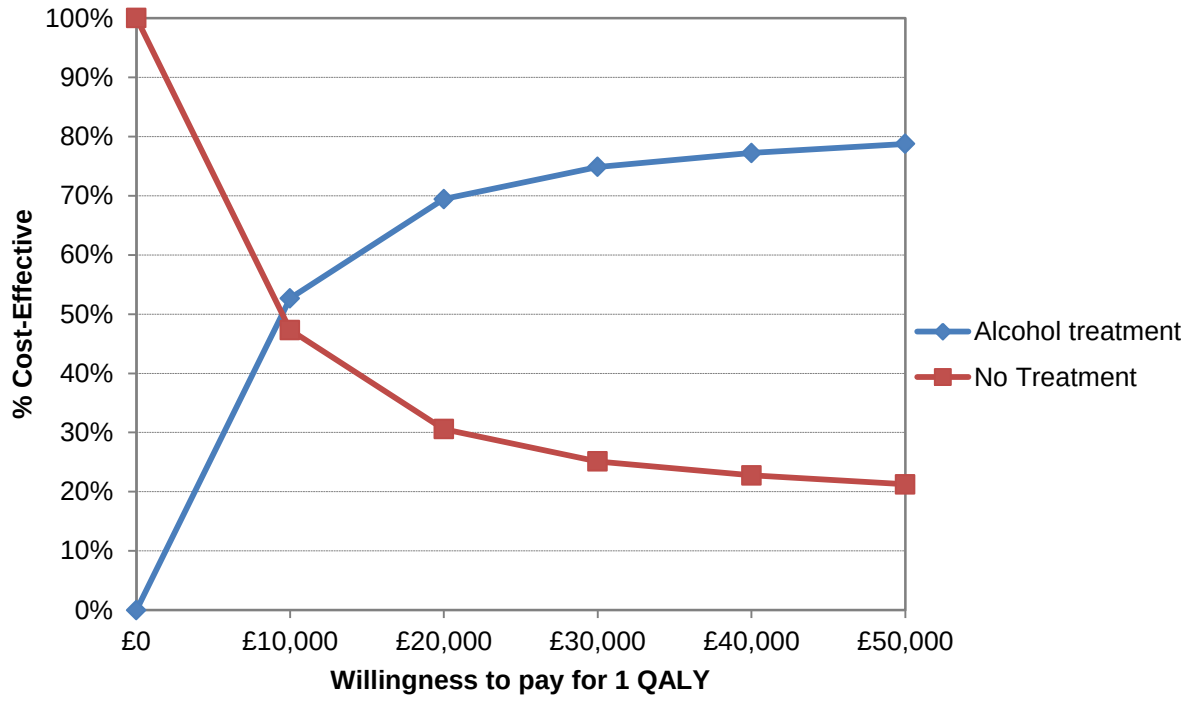
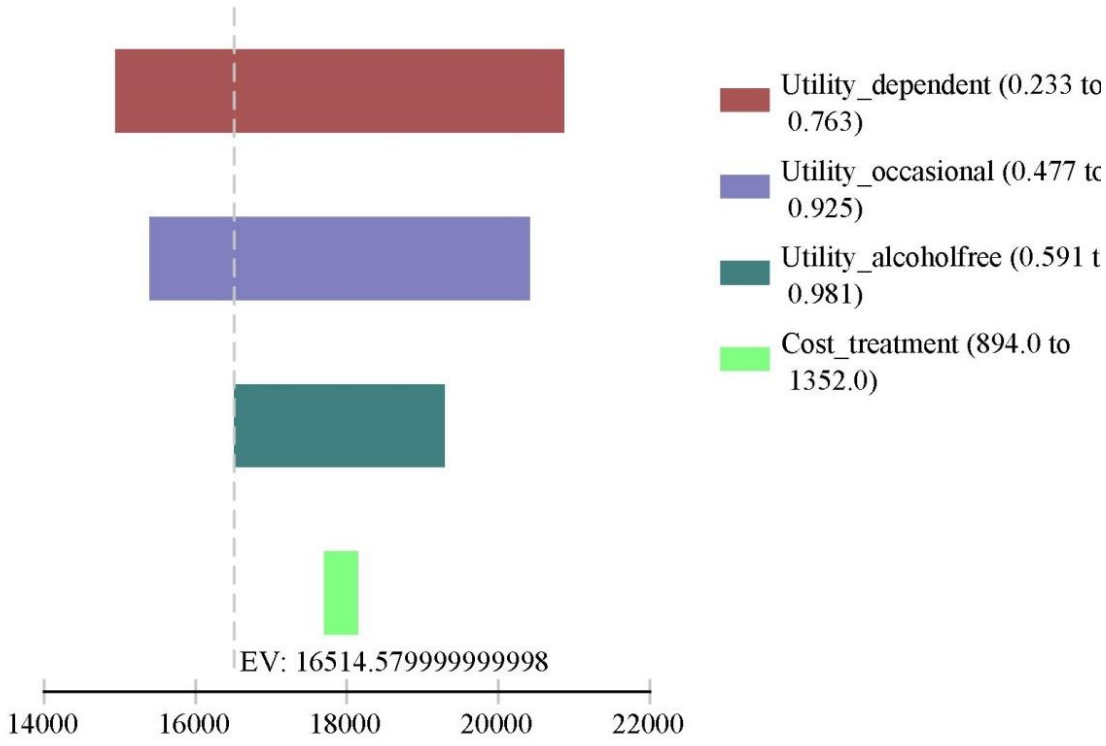


Figure 40. Tornado diagram showing one way sensitivity analyses for alcohol specialist treatment. EV= expected value of net mean benefits.



Alcohol Residential Detoxification - Economic Model Results

Birchwood residential detoxification was provided by ARCH initiatives, who offered a residential detoxification service for people with drug and alcohol problems, with intensive one-to-one advice, medical and therapeutic support, life skills sessions and alternative therapies. They also prescribed benzodiazepines and anticonvulsant drugs alongside vitamin supplements where appropriate. Evidence from the US suggests that outcomes for residential detoxification and community detoxification are similar (Hayashida et al., 1989). Outpatient withdrawal allows people to access more social support from their families or to potentially carry on with job or family commitments. Inpatient detoxification is more appropriate where someone has severe side effects of withdrawal, does not have social support, or has other health problems that need to be monitored. Outpatient detoxification can be less expensive and time consuming than inpatient detoxification (Parrott et al., 2006b). The data was provided for 673 admissions for 562 unique clients admitted in 2010/11 and 2011/12 financial years (see Table 32). Based on the alcohol performance report for 2011/12, there were 296 people from Wirral who entered Birchwood, of whom 88% (260) had a planned discharge.

Table 32. Proportion of alcohol residential detoxification clients by age group and gender, 2011/12.

Age Group	Female	Male	Total
16-24	0%	1%	1%
25-39	13%	21%	34%
40-54	21%	28%	49%
55-64	5%	8%	13%
65+	1%	1%	2%
Total	**41%**	**59%**	**100%**

Nearly 90% of clients completed treatment in Birchwood as alcohol free (see Table 33). Females had a slightly higher rate of completing treatment than males (93% in women vs. 86% in men). The average number of days in Birchwood for all clients was 7.7 days. For clients who completed, the average was 8.3 days. The average age was similar for completers and non-completers.

Table 33. Alcohol Residential Detoxification - Treatment outcomes with average age and average number of days.

Outcome	N clients	% of clients	Average Age	Average Number of Days in Birchwood
Treatment Complete - Alcohol Free	332	88.77%	43.4	8.33
Dropped out	23	6.15%	44.0	2.83
Treatment Withdrawn by provider	13	3.48%	41.0	3.23
Treatment commencement declined by client	4	1.07%	48.0	1.00
Transferred - not in custody	2	0.53%	62.5	3.00
Total	374	100.00%	43.5	7.71

As part of the economic evaluation, hospital admissions data was analysed to determine whether being admitted to Birchwood was associated with a reduction in alcohol related admissions after discharge from Birchwood (see Table 34). This data is for inpatient admissions and does not include A&E presentations or outpatient appointments. This data includes diagnosis codes which are regarded as having an alcohol attributable fraction and codes that are regarded as being alcohol specific. This hospital admissions data was matched up to Birchwood data using a matching algorithm and approximately 60% of clients were matched up to at least one hospital admission. Each client had an average of 6.5 admissions over the five years analysed providing an estimate of an average of 1.2 admissions per year. The total cost of hospital admissions for these clients across six years was estimated as being approximately £1.5million, based on the HRG tariff costs for the hospital admissions which are recorded in the admission tables.

Table 34. Alcohol related hospital admissions in Wirral for alcohol residential detoxification clients.

Outcome	Year of admission to alcohol residential detoxification	
	2010/11	2011/12
Number of clients with hospital admissions	168	209
Total unique Birchwood clients within year	273	352
% of clients with hospital admissions	62%	59%
Total hospital admissions Apr 2006-Aug 2012	1127	1301
Average admissions per client with any admissions	6.7	6.2
Average number of admissions per year	1.24	1.15

For patients admitted to Birchwood in 2010/11 and/or 2011/12 the most common alcohol-related diagnoses for their history of hospital admissions were mental and behavioural disorders due to alcohol which accounted for 71% of admissions (see Table 35).

Table 35. Alcohol related conditions for hospital admissions for alcohol residential detoxification clients.

Alcohol related condition	Number of admissions
Mental and behavioural disorders due to use of alcohol	1445
Ethanol poisoning	204
Alcoholic liver disease	110
Alcoholic gastritis	59
Hypertensive diseases	39
Epilepsy and Status epilepticus	32
Assault	25
Intentional self-harm/Event of undetermined intent	23
Fall injuries	20
Chronic pancreatitis (alcohol induced)	15
Cardiac arrhythmias	14
Acute and chronic pancreatitis	7
Other	31
Total	2024

The average number of hospital admissions for Birchwood clients appeared to tail off in the year after they were admitted to Birchwood, which indicates that admission to Birchwood may be successful in preventing future hospital admissions. However it is possible that clients were experiencing a time of crisis during which they were more likely to be admitted to hospital and have since overcome this crisis and have shown regression to the mean. There is a spike in the average number of hospital admissions around the time of admission to Birchwood which is not surprising as many clients are admitted straight to Birchwood from hospital. Admissions also appear to show a slight but insignificant downward trend after admission to Birchwood.

A Markov chain economic model was constructed as described in the methods section of this chapter. The budget for Birchwood alcohol residential detoxification was £280,000 for 2011/12. There were 296 clients of whom 260 completed successfully. The cost per client was £946 and the cost per completer was £1,077. The results of the economic model are shown in Table 36.

Residential detoxification resulted in a modest increase in the average number of quality adjusted life years (QALYs) experienced (0.09 QALYs gained or around 1 month of quality adjusted life expectancy), and a decrease of £653 in discounted costs incurred over the next 50 years. These results mean that residential detoxification is a dominant strategy, i.e. in the long term it is cheaper and more effective than the alternative. As a rough rule of thumb, if dependent drinkers cost an additional £1800 per year in healthcare costs, and if Birchwood residential detoxification costs £946 per client, then if residential detoxification can stop someone being a dependent drinker for six months it will pay for itself in offset healthcare costs.

Probabilistic Sensitivity Analysis – Alcohol Residential Detox

A probabilistic sensitivity analysis (PSA) was carried out to see how sensitive the model results were to uncertainties in the input parameters. Because relapse and mortality rates were high, and quality of life for dependent drinkers was low, the total number of discounted QALYs experienced was low despite the model being a lifetime Markov model. In the base case scenario, residential detox was less costly and more effective than treatment as usual without residential detox, so was the dominant option (Table 38). However both scenarios tended towards the same maximum QALY expectancy, and as willingness to pay for one

QALY increased, the no residential detox option becomes slightly more likely to be cost effective but is still dominated by the residential detox option (Figure 42). Overall the PSA suggested that the detoxification treatment may only present marginal benefits when compared to other treatment.

Table 36. Results of probabilistic economic model with 95% confidence intervals.

	Life time horizon	
	Treatment	No treatment
Total cost (CI)	£829,231 (£710,498-£955,507)	£850,978 (£728,581-£981,148)
Total QALYs (CI)	0.801 (0.173 -1.420)	0.780 (0.124 - 1.420)
Cost per patient (CI)	£2,801 (£2,400 - £3,228)	£2,875 (£2,461 - £3,315)
Cost per completer (CI)	£3,189 (2,733 - £3,675)	£3,273 (£2,802-£3,774)
Cost per QALY (CI)	£8,744 (-£9,812 to £27,548)	£9,469 (-£9,766 to £28,991)
ICER	Dominant	Dominated

Figure 41. Alcohol residential detoxification, iterations of incremental cost effectiveness, with ellipse showing 95% prediction intervals.

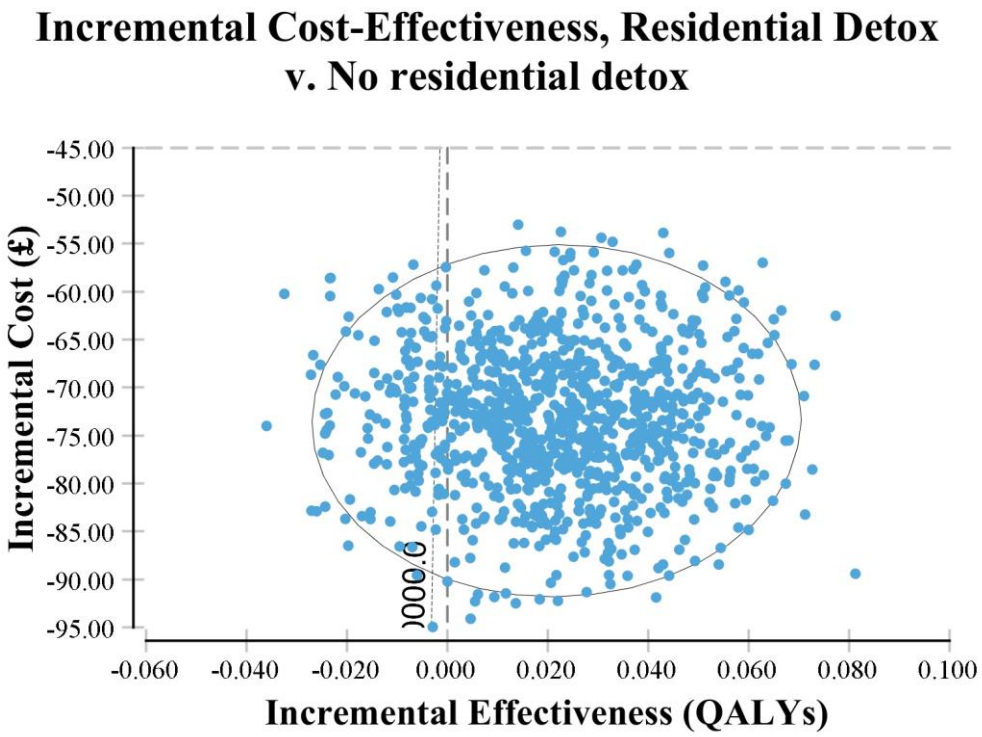


Figure 42. Cost effectiveness acceptability curve for alcohol residential detoxification showing probability of alcohol detoxification being cost effective vs no detoxification being cost effective at different values of willingness to pay for one QALY.

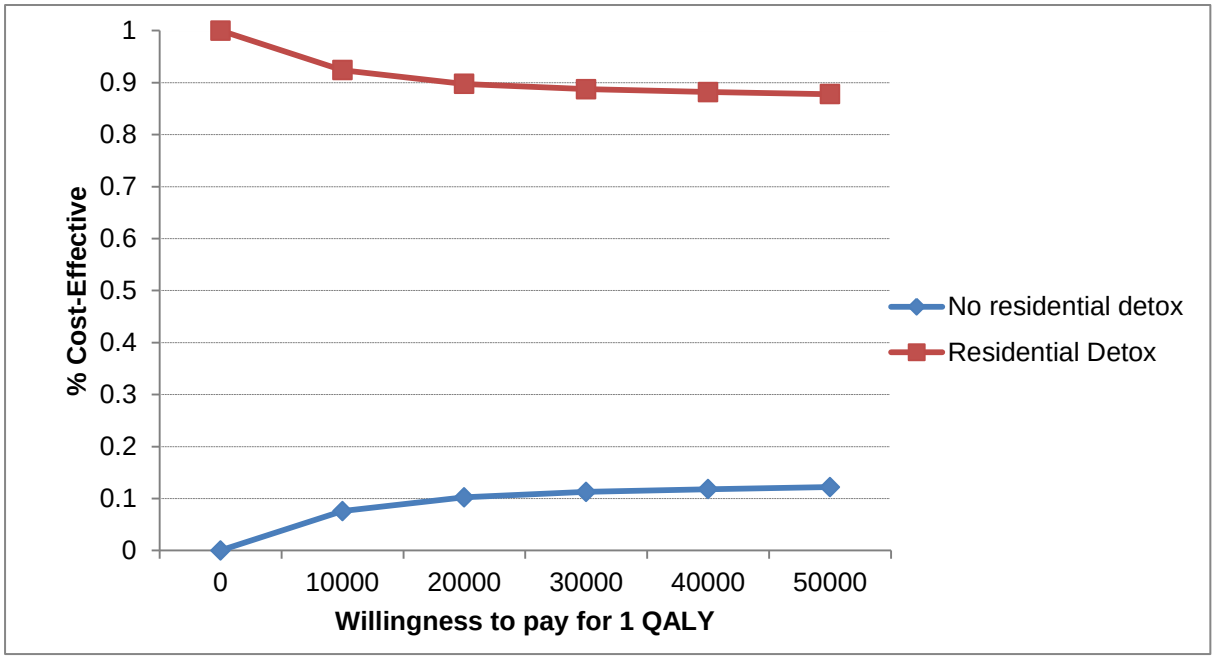
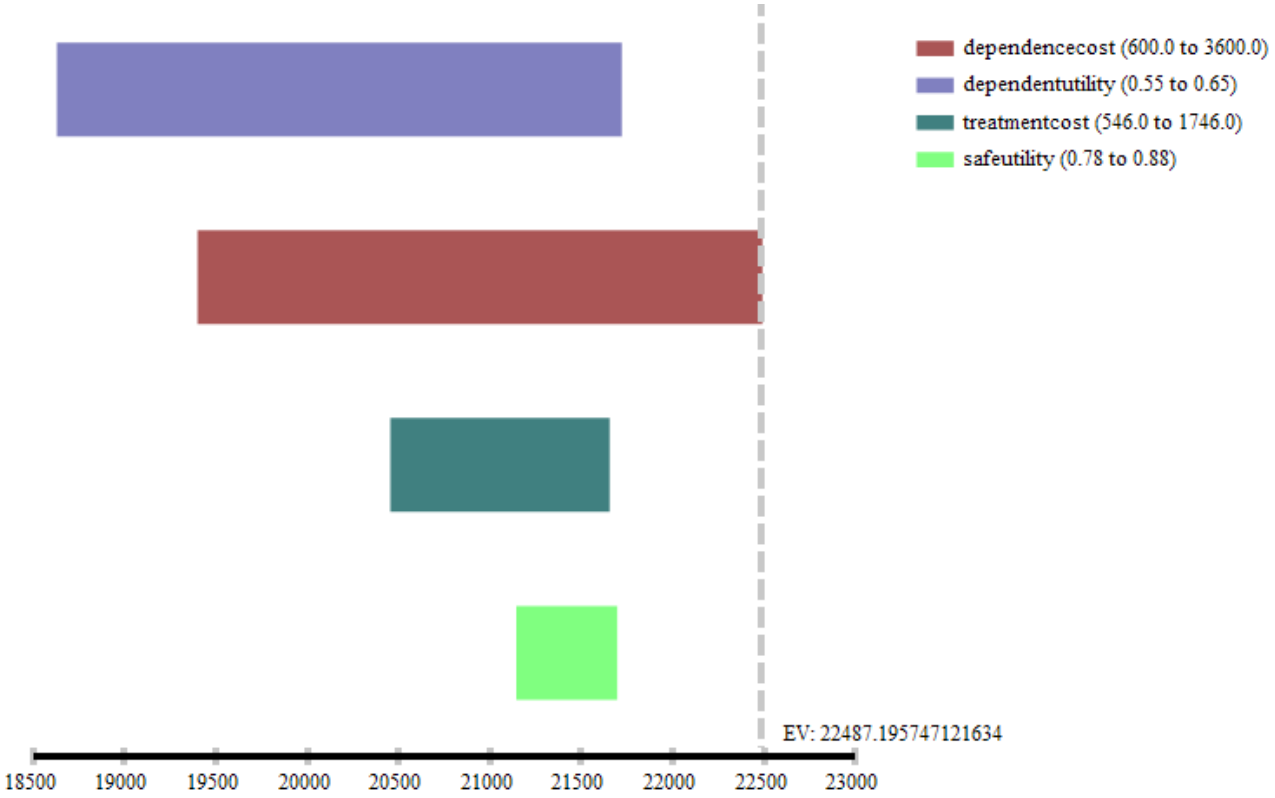


Figure 43. Alcohol residential detox. Tornado diagram showing one way sensitivity analyses. EV= expected value of net mean benefits.



Alcohol Services – Realist Evaluation

One table was produced for all services in terms of alcohol context-mechanism-outcome configurations. In a search for previous realist evaluations of alcohol services, one PhD thesis with several presentations was found (Doi, 2012) which was a realist evaluation of midwives providing alcohol screening and brief interventions to pregnant women. This found that the impact of the intervention was limited by midwives' levels of confidence in asking questions about alcohol, competing clinical priorities, low numbers of women eligible for a brief intervention, and women providing socially desirable responses (i.e. saying that they did not drink alcohol when in fact they did). Hunter and colleagues (2012) used realist synthesis methods (a form of qualitative systematic review) to synthesize data from a sample of drug and alcohol related programmes in Australia to determine the barriers and facilitators in implementing these programmes.

Holmes & colleagues (2014) outlined a 'Transparent Reporting of Alcohol Intervention ContExts' (TRAICE) checklist for reporting the policy contexts of alcohol interventions. This says that any research around alcohol policy interventions should report (i) baseline alcohol consumption, norms and harm rates; (ii) baseline affordability and availability; (iii) social, microeconomic and demographic contexts; (iv) macroeconomic context; (v) market context;

and (vi) wider policy, political and media context. This is a useful way of thinking about alcohol interventions where context is important, for example a lot of the evidence for alcohol interventions comes from the US which has a different drinking culture than the UK, and the price of alcohol varies a lot between countries; Scandinavian countries typically have very high alcohol duties (Anderson et al., 2009).

The alcohol CMO configurations are shown in Table 37. These were worked through from talking to service providers, commissioners and some service users as well as looking through evidence and policy documents.

Table 37. Alcohol Context-Mechanism-Outcome Table. SC= source of information is local service commissioner, SM= source of information is service managers.

Group	Context	Mechanisms	Outcome
General Population	Drinking excess alcohol is a mainstay of British culture, and working class culture in particular. Many people in the general population drink too much and are at increased risk (Williams et al., 2014).	Alcohol screening and brief intervention makes people realise that they may be harming their health by drinking too much (Dhital et al., 2015)	A proportion of people move from hazardous to safe levels of drinking. There is an increase in knowledge about safe levels of alcohol consumption, particularly in Wirral where there has been in excess of 50,000 screenings carried out in the last ten years (Dhital et al., 2015)
General Population	Alcohol has got cheaper in supermarkets and off licenses while getting more expensive in bars and clubs (Gill et al., 2015).	People on low incomes who want to drink alcohol cannot always afford to drink regularly outside of the home (SC).	More people are drinking at home. This leads to an increase in the risk of domestic violence in some cases (SM).
Dependent Drinkers	Alcohol dependence affects around 4-8% of the population. It is one of the most common substance use disorders because most people in the population are exposed to alcohol and it is easy for harmful drinking to go undetected. A proportion of young hazardous drinkers become dependent drinkers in middle age, with adverse life events, relationship breakdown, and unemployment being risk factors (Shield et al., 2014).	Pharmacological treatments like Librium reduce the short term symptoms of withdrawal. Psychosocial interventions allow people to explore and confront the causes of their alcohol use. CBT-based interventions help people to change their behaviour and understand what their triggers are. Shared care with GPs gives general practitioners easy access to services and detoxification. Residential detoxification allows people to dry out under controlled conditions (Shield et al., 2014).	Some dependent drinkers move into controlled drinking or being abstinent. Some will not complete treatment or will relapse. Alcohol is a fixture of culture and is more omnipresent than other drugs so can be harder to give up.

Young people	The culture around alcohol in young people is changing. There are more interventions around pubs and off sales to reduce alcohol sales to young people.	Because youth unemployment is high, young people are more competitive in terms of performance in schools, university and the jobs market. This has made drinking excess alcohol less of a priority for them. Also because of the proliferation of smart phones, young people are scared of having their drunken behaviour shared on social media and being 'cybershamed'.	Young people are drinking less alcohol. Getting drunk is becoming less of a rite of passage for young people.
Young women	Young women in their 20s are more likely to not be in relationships, and are often outperforming young men in the jobs market so they are likely to have more money and more freedom.	Women in their 20s are going out socialising more.	Women in their 20s are drinking greater amounts of alcohol and are suffering increasing amounts of liver damage.

6.4.7 Discussion

The modelling suggested that, even using quite a narrow set of outcomes, the specialist alcohol treatment services are likely to be cost effective. For identification and brief advice (IBA), the estimated lifetime cost per QALY (quality adjusted life year) gained was £3,644. For specialist alcohol services provided by CWP, 1 year cost per QALY gained was £7,761 and clients showed a significant improvement in all outcomes collected, such as fewer drinking days, and better physical & psychological health. For Birchwood residential detoxification, a lifetime model estimated that services produced a net increase in QALYs at a reduced cost, meaning the service was more effective and cheaper than a 'do nothing' alternative. This work had strengths in that it used local, individual level data which gave it a good deal of internal validity. A weakness of this work was that it used before and after rather than control group comparison, and that it did not consider all of the wider social value associated with people moving from being a dependent drinker to be in recovery. However the before and after analysis found a pattern of positive change on several variables, which is more evidence for the change being real.

This evaluation found that the conversion rate from screening to brief intervention, and to referral into services is lower than would be expected given the estimated prevalence of alcohol problems in the population and recommended that services should increase the number of men screened. The evaluation recommended that treatment services should collect more long term follow-up data to know how people fare in the long term after being discharged from alcohol treatment. It also recommended that services needed to engage more with young people, as the evidence suggests there are a lot of people in their 20s who are problem drinkers but numbers in treatment are low in comparison. The evaluation noted

that services only seem to cater for dependent drinkers and recommended that some kind of intermediate service may be needed for hazardous drinkers for whom a brief intervention is not enough.

Out of the results from this piece of work, the result that was most powerful was the finding that going through residential detoxification did not seem to reduce subsequent hospital admissions. The evaluation did put several caveats around this finding, such as that the data matching process used was not ideal; and that with some clients it may be that, as they have conquered their alcohol problems, other health problems have come to the surface, so they are still likely to have hospital admissions. However if the continued hospital activity was due to underlying health problems, you would expect more outpatient appointments and elective (planned) admissions rather than a continuing pattern of mainly emergency, alcohol-related admissions. There may also be issues with how hospital admissions are coded; coding is not an exact science and people's past hospital admission codes are often appended onto their subsequent admission diagnosis codes, so if someone has previously been admitted for liver disease and is subsequently admitted for skin cancer, the primary code may be skin cancer but there may still be a secondary code of liver disease which would result in the admission coding as alcohol-related. Overall, there is debate for whether people should go from detoxification into aftercare or into treatment services. This evaluation recommended that in future some comparison could be made between residential and community detoxification.

6.4.8 Conclusion

This analysis in general supported the cost effectiveness of alcohol services provided in Wirral. This work had direct policy relevance as it was used to influence the development of new contracts for alcohol services, which were put out to tender around six months after this programme of work was completed. Because the analysis indicated that residential detoxification may not prevent hospital admissions, this prompted more investigation and more data collection. It highlighted the importance of clarity concerning service objectives as residential detoxification may be a lifesaving safety net for the small proportion of highly dependent drinkers who end up there. This analysis was universally perceived as being a valuable contribution to policymaking as it established the parameters around which contracts were established and helped to determine which outcomes were considered most important in the future.

This analysis reinforced the importance of alcohol as a lifestyle risk factor in Wirral, having a high cost to the local economy in terms of health, crime and lost productivity. The local authority has since taken a greater interest in using its licensing powers and is piloting a

‘Reducing the Strength’ intervention where off licenses are asked to voluntarily stop selling high strength lager and cider which is typically consumed by dependent street drinkers and young people.

Chapter 7. Economic Evaluation of Drug Treatment Services

This third set of case studies provided the opportunity to apply a mixed methods approach to evaluation using a combination of mutually supportive qualitative and quantitative techniques to comprehensively assess a complex intervention in a complex system. This chapter has tried to integrate the data analysis with the qualitative results obtained though undertaking detailed semi structured interviews with commissioners, providers, and current and ex-service users. As with tobacco and alcohol, the main outcome for this analysis was cost per QALY (quality adjusted life year), known as cost utility analysis (CUA). Modelling the cost effectiveness of interventions for addictive behaviours is complicated by the fact that service users experience cycles of relapse and recovery. It is also difficult to model the productivity gains as many people experience chaotic lifestyles that perhaps are not suited to paid employment (Smith & Riach, 2014). The analysis therefore largely concentrates on the extent to which service provision contributes towards an improved quality of life, reduced risk of dying and reduced resource use in terms of health, social care and the criminal justice system.

A great deal of national evidence has been produced concerning the cost effectiveness and economic impact of drug treatment. So the focus of this analysis largely concentrated on how drug treatment worked at a local level in Wirral. To what extent did such local services perform similarly to the evidence, outperformed the evidence, or performed less well than the evidence would predict.

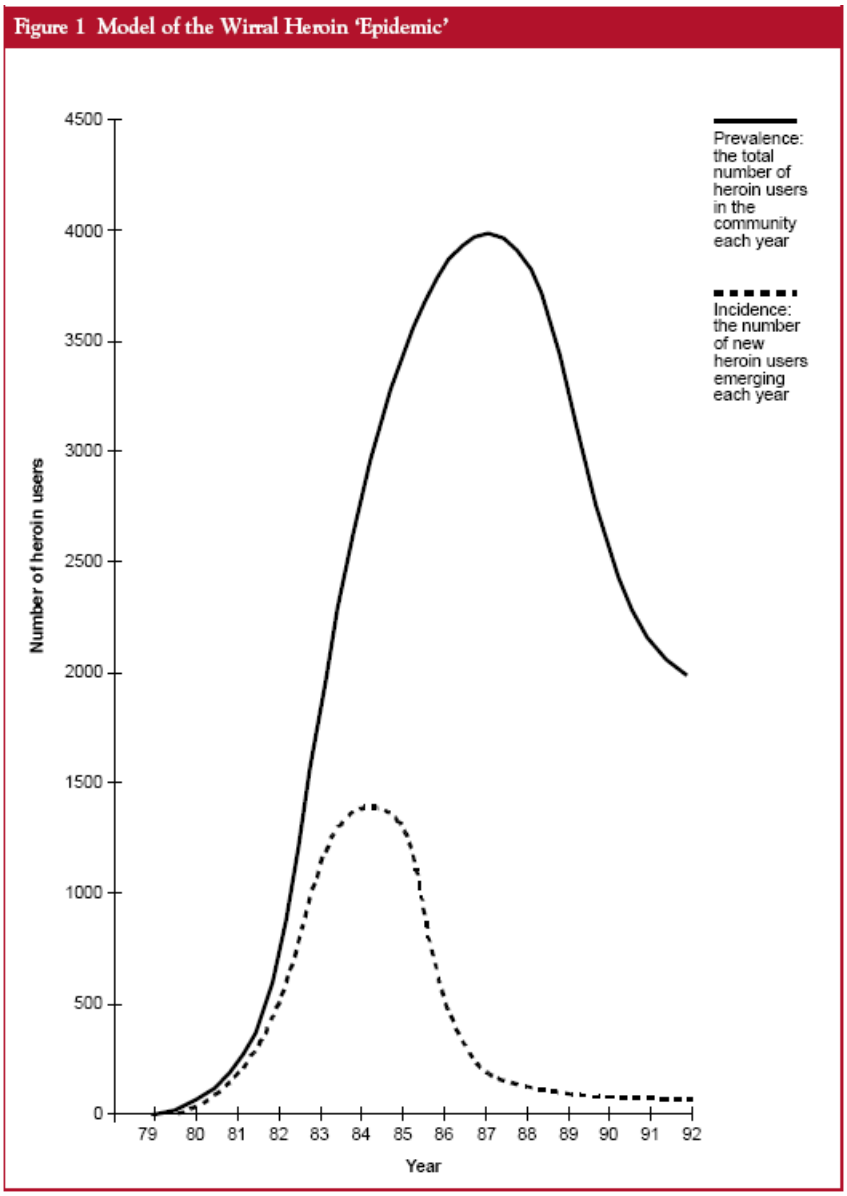
7.1 Drugs - Burden of Disease

Problematic drug use is estimated to affect 0.8% of the adult population in England, or 1 in 125 people. About a third of the UK population admit to taking drugs at some stage in their lives (Home Office, 2013), most commonly cannabis, but few people go on to develop problems. Between 2011 and 2012, an estimated 8.9% of adults in the UK used an illegal drug which increases to 19.3% for young people aged between 16 and 24. There are an estimated 299,000 heroin and crack cocaine users in England, and in prisons 40% of people have used heroin at some point in their lives. It is estimated that 1.2 million adults are significantly affected by a family member's illegal drug use. Drug use often follows a sequence, where people generally move from beer or wine, to cigarettes and/or spirits, to cannabis, and then to other illegal drugs (Kandel, 1975). For the majority of casual users little harm is done however some people become addicted leading to the potential for being criminalised, feeling ostracised or isolated from family or society, financial hardship, physical and mental ill health, prison, and potentially a very early death from overdose or the serious

adverse health effects resulting from long term drug abuse. The drugs trade also damages communities in the countries where drugs are made, such as heroin in Afghanistan, cocaine in Peru, and sassafras oil for ecstasy in Burma and Cambodia as well as communities in areas where illegal drug use is endemic (Mannava et al., 2013). Problematic drug use is more common in countries with greater income inequality, and is more common in deprived communities within countries (Wilkinson & Pickett, 2009). Conflict theory (Currie, 1993) hypothesises that heroin and crack use are concentrated in urban areas, where lack of economic opportunities leads to community feelings of powerlessness and alienation and a breakdown of communities and families.

Many drug users are second or third generation drug users; one person working in drug treatment in Wirral talked about people "whose mum bought you a bag of smack for your 16th birthday". For problematic drug users, their drug use is characterised by dependence and addiction, where drug taking behaviour becomes unconscious or compulsive and usually causes harm or is risky. In Wirral and other deprived areas in the north of England, drug use became a big problem in the early 1980s with a boom in brown heroin use following the onset of high unemployment. In Wirral some people started using heroin who had previously been injecting Diconal, a drug which had been prescribed by many Wirral GPs in the late 1970s (Parker et al., 1998). Many people had also been using and injecting amphetamine. Drug use is mainly spread by micro diffusion which is person to person contact. Drug users will often want to reinforce their own behaviour, so involving other acquaintances in their behaviour makes them feel like what they are doing is more socially acceptable. Drug users can often get into debt with their dealers and have to work for them to pay back their debt, becoming their dealer's "foot soldiers". In Wirral it was estimated that the number of new heroin users peaked in 1985 at about 1,400 while the total number of users peaked in 1988 at around 4,000 users (Parker et al., 1998, see Figure 44). It is not clear to what extent the prevalence of heroin use is driven by the cost and availability of the drug, the social acceptability of it, the ratio of pleasurable effects to side effects, and the quality of social ties & employment and the amount of social capital in the population.

Figure 44. Model of the initial Wirral heroin outbreak, showing numbers of new users and total users, 1979-1992.



From Home Office (1998) New Heroin Outbreaks Amongst Young People in England and Wales (Parker et al., 1998).

In 1983, crime rates in Merseyside were increasing rapidly and it was estimated that around 1 in 10 young people were using heroin (Parker et al., 1988). Burglary in Wirral increased from 2,824 in 1979 to 10,238 in 1986 and 50% of people arrested for burglary were opiate users. The UK heroin market was centred on Merseyside with a small number of individuals and families controlling the business; this also brought an increase in gun crime which was damaging to the economy and to people's perceptions of community safety (Bennett & Holloway, 2004). In Wirral there was a burglary epidemic caused by heroin addicts, some of whom had previous criminal 'deviant careers', while some were driven by 'economic necessity' (Parker & Newcombe, 1987). Merseyside was also where the public health response began; Liverpool had the first needle exchange in 1986 and methadone prescribing programmes were introduced across Merseyside in the late 1980s (Ashton & Seymour, 2010). This approach is now used around the world so this is an example of 'bottom up' policy making. Harm reduction interventions are still a source of debate, such as whether it is a good idea to give drug users naloxone (an opiate antagonist) to counteract the effects of opiate overdose and save lives, or whether it will encourage more risky behaviour which would counteract the benefits. A study in the US suggested that naloxone did not promote more risky behaviour but did save lives (Maxwell et al., 2006). Another intervention is to have supervised heroin injections for the 5-10% of opiate users who cannot stop injecting heroin, however this can be costly compared to oral methadone and may also be politically unpalatable (Byford et al., 2013). Most addicted clients in Wirral were on long term oral methadone, although Wirral also prescribed heroin for a very small number of long term users.

Crack cocaine took off in the US in the late 1970s and was first noticed by UK drug treatment services in 1989. Use of crack increased as evidenced by a 74% increase in UK seizures of crack cocaine between 2000 and 2006. With crack cocaine there is no substitution therapy and nearly all crack users smoke it so do not need needle exchange services. Crack use is also associated with acquisitive crime, drug dealing, begging and prostitution as people become more dependent and need to make money quickly, as some users spend as much as £400 a day on crack. In Wirral most crack users are also opiate users; often using heroin to deal with the comedowns from crack highs which are particularly unpleasant.

Drug use often leads to dependence and an early death for many users. But the main reason so much investment was put into drug treatment services was not to improve the lives of drug users. It was to reduce crime, and to reduce the risk of infectious disease outbreaks that may spill over into the non-drug using population. One of the successes of

the harm reduction approach in areas like Wirral was that because of needle & syringe exchange services they avoided the type of large scale HIV outbreak that was seen in other areas like Edinburgh in the 1980s (Robertson et al., 1986), and is seen in places like Russia now (Eaton et al., 1998).

There is a lack of local data about levels of drug use for individuals who are not in services as questions about drug use are often not included in local adult lifestyle surveys due to ethical considerations and issues around reliability of responses. Figure 45 and Figure 46 provide estimates of drug use in Wirral based on data from the Crime Survey for England and Wales (Home Office, 2013) applied to the Wirral population. There are obvious limitations with this method but it may be useful for a 'ballpark' figure. The most widely used drugs are cannabis, nitrous oxide [laughing gas or 'balloons'] and powder cocaine.

Figure 45. Estimated number of people using selected drugs in Wirral.

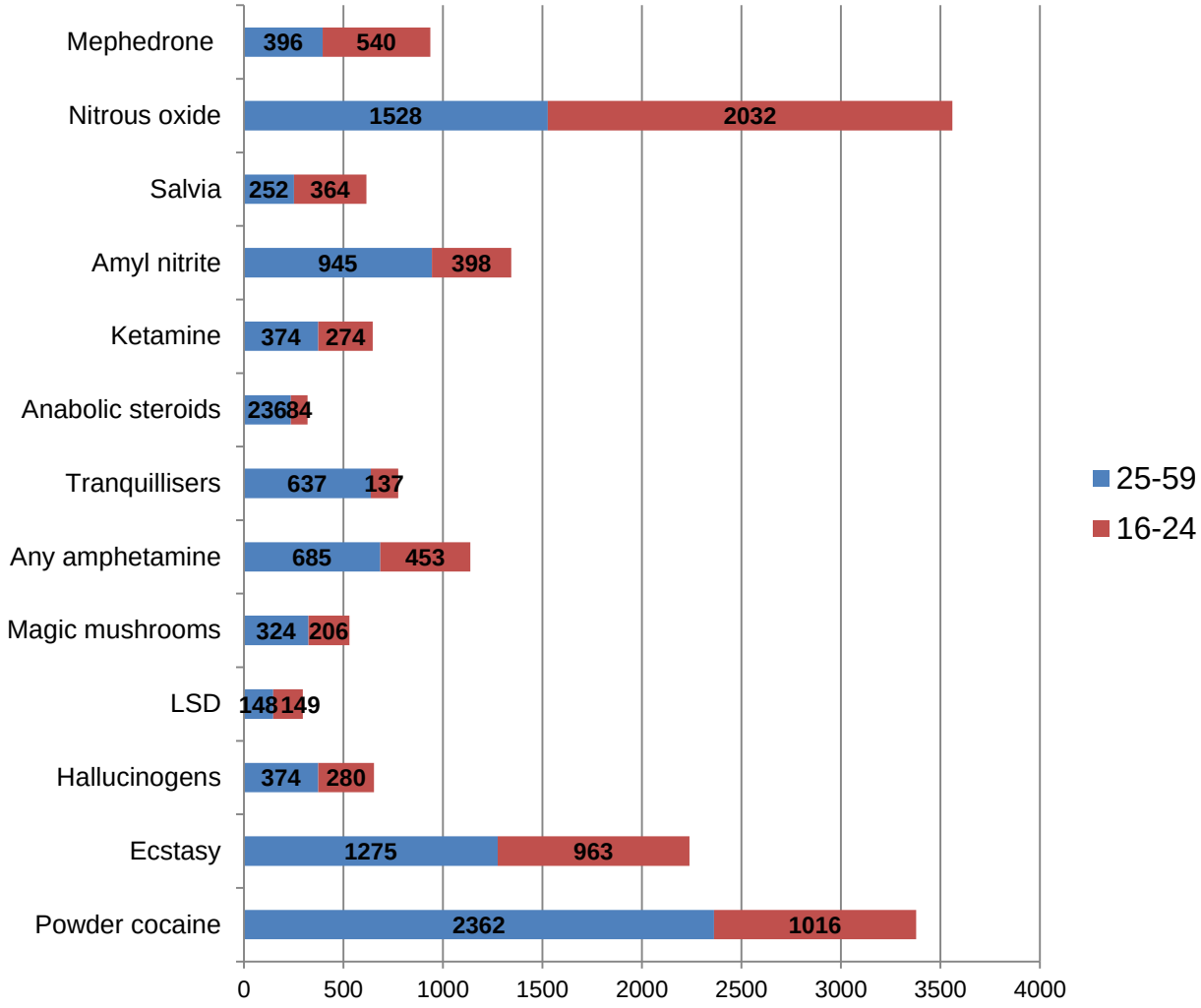
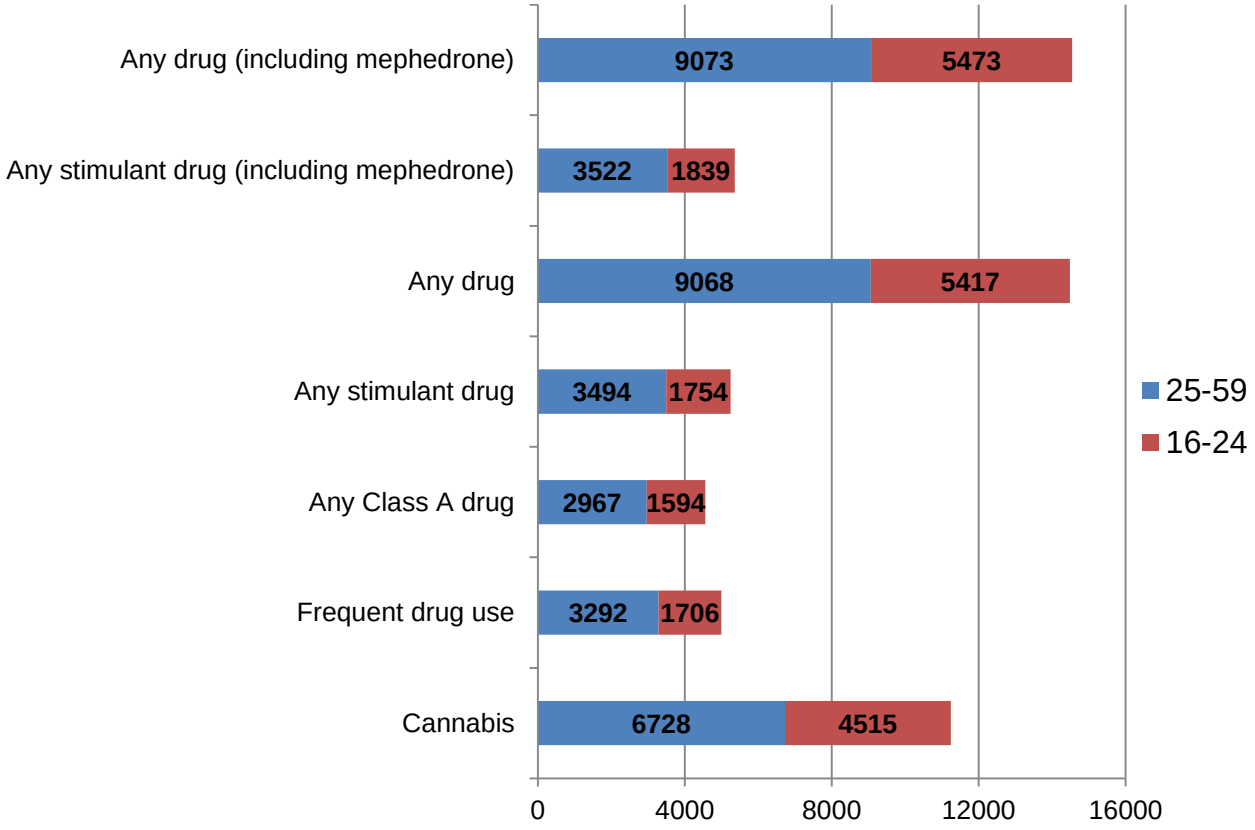


Figure 46. Estimated numbers using any drugs in Wirral



The most recent opiate and crack prevalence estimates for 2010/11 indicated that Wirral had 3,000 opiate and/or crack users (OCUs) (Hay et al., 2010) which equates to 1 in 63 adults. Based on these estimates, Wirral had the 10th highest rate of opiate and crack users in the country, at 15.69 per 1000 population with 684 Wirral residents injecting.

In 2010/11 Wirral had 2,047 opiate or crack users in treatment and nearly all crack users in treatment were also opiate users implying that 32% of crack or heroin users were not in treatment. However local service providers stated that they believed that nearly all opiate and crack users were known to services. A recent study in Merseyside found that methadone provided for therapeutic purposes is frequently diverted, with people passing it on to friends or selling it (Duffy & Baldwin, 2012). They found that 60% of opiate users interviewed had obtained illicit methadone in the last 12 months. This could be an indicator of people not being prescribed as much methadone as they think they need, and could indicate that more supervised methadone consumption should be used,

Figure 47. Estimated number of opiate & crack users, and injectors, Wirral 2010/11. From Hay et al., 2010.

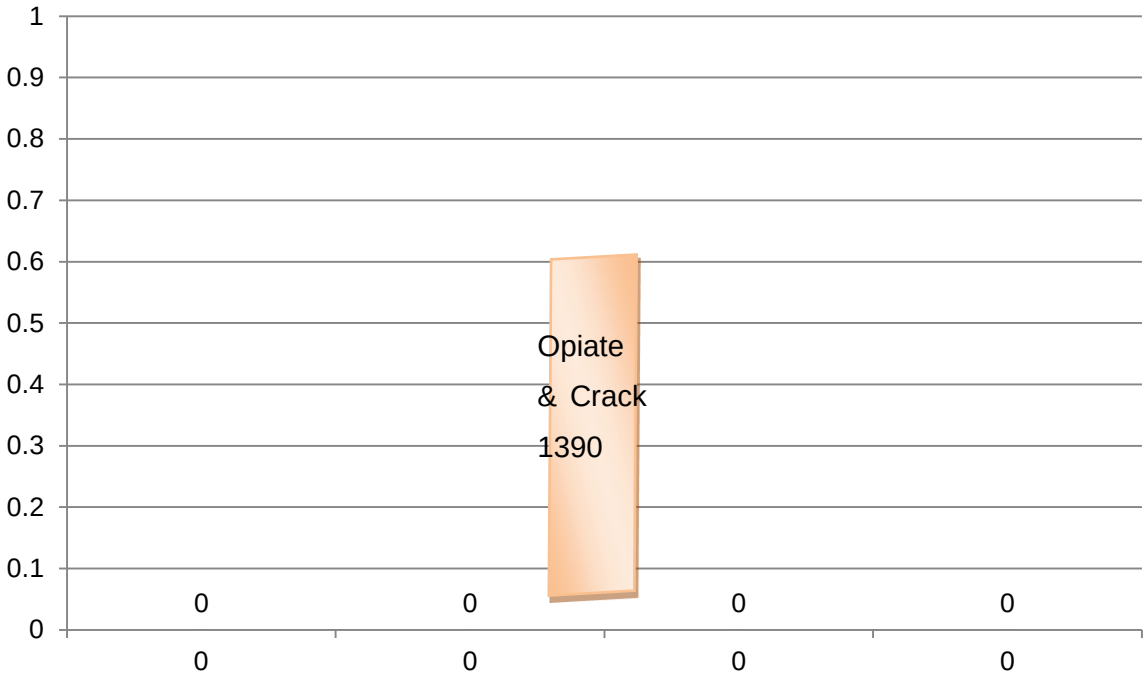
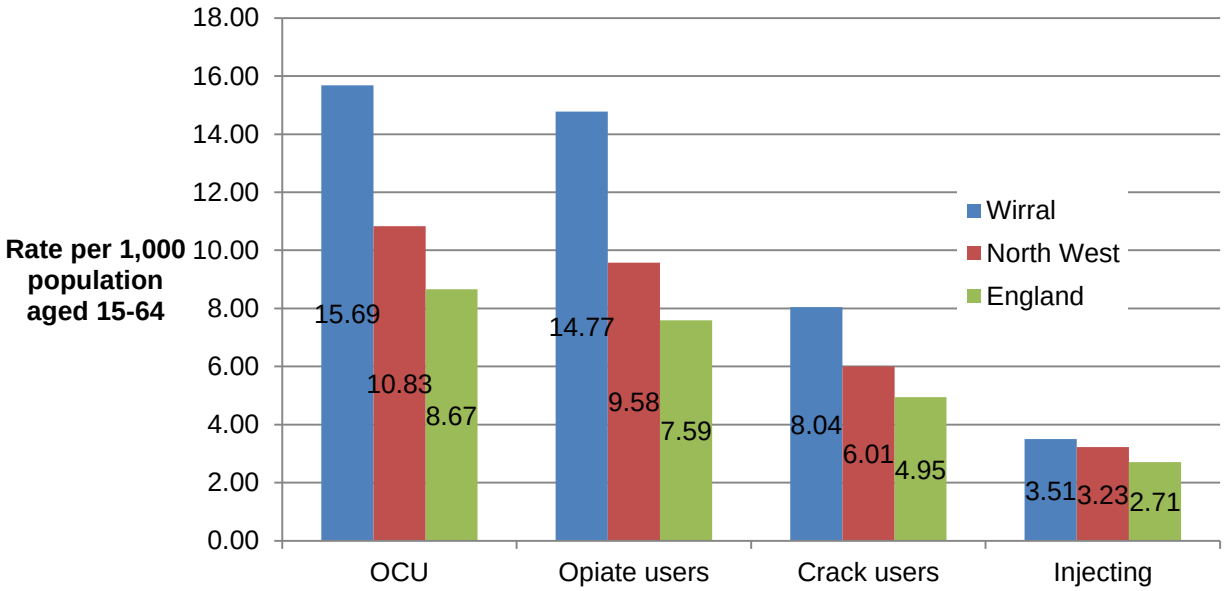


Figure 48. Estimated prevalence rate of opiate & crack users, and injectors, Wirral, North West & England, 2010/11. From Hay et al., 2010.



In Wirral, the number of people in drug treatment has fallen slightly since 2007, while the number of successful completions has increased. For Wirral, 41 (1.7%) clients in 2012/13 accessed residential rehabilitation facilities which is slightly lower than the national average of 2.1%. It may well be that because good alternatives are provided in the community, clients are less likely to require residential care.

Table 38. Numbers of people in drug treatment and completions, Wirral, 2005/06 to 2012/13. Data from historic performance reports for Wirral.

Variable / Year >	**2005 /06**	**2006 /07**	**2007 /08**	**2008 /09**	**2009 /10**	**2010 /11**	**2011 /12**	**2012 /13**
Successful Completions	66	133	245	249	319	374	380	404
Treatment complete drug free (opiates) [measured since 2011/12]							288	150
Numbers in Effective Treatment	2399	2526	2640	2578	2448	2377	2355	2242
Numbers In Treatment	2497	2667	2753	2714	2530	2461	2468	2363
Waiting Times < 3 Weeks	247	443	600	716	666	639	749	683
Percent of Waits < 3 Weeks	81	90	93	98	97	99	99	99

In terms of time in treatment, Wirral has a comparatively high proportion of clients who have been in treatment for more than 6 years and for less than 1 year when compared with a cluster of similar areas. Approximately 50% of clients have a drug taking career of over 21 years. This data highlights the barriers to getting people to stop their drug use completely, as many have been using drugs for their entire adult life. The picture for Wirral is of an older treatment population who have been in treatment for a long time and have a long drug taking career. These individuals find it hard to leave treatment but when they do leave, are likely to maintain their recovery.

Figure 49. Proportion of drug population in treatment by years in treatment, Wirral vs. cluster, 2010/11 to 2012/13. From NTA (2013).

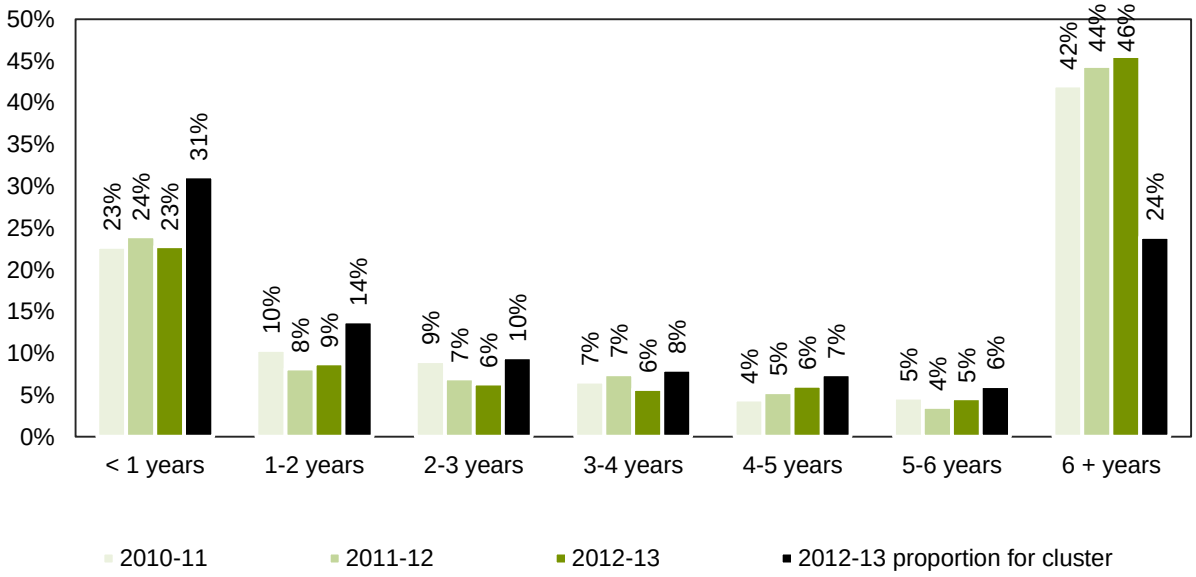


Figure 50. Proportion of drug population by length of drug taking career, Wirral vs. cluster, 2010/11 to 2012/13. From NTA (2013).

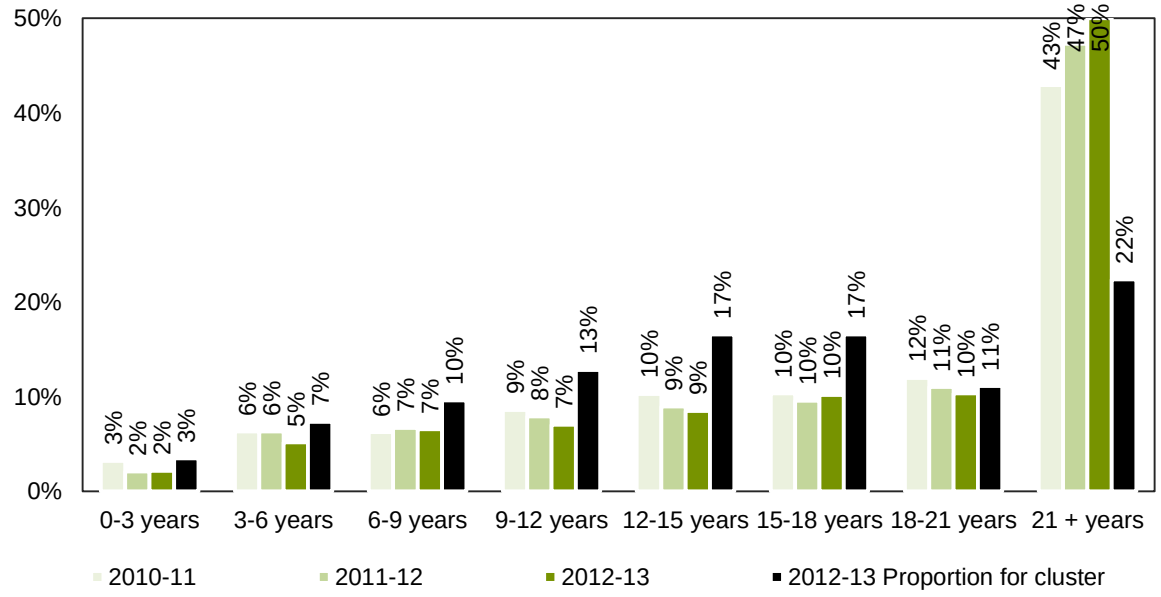


Figure 51. Treatment naïve clients by length of stay, Wirral vs. cluster, 2010/11 to 2012/13. From NTA (2013).

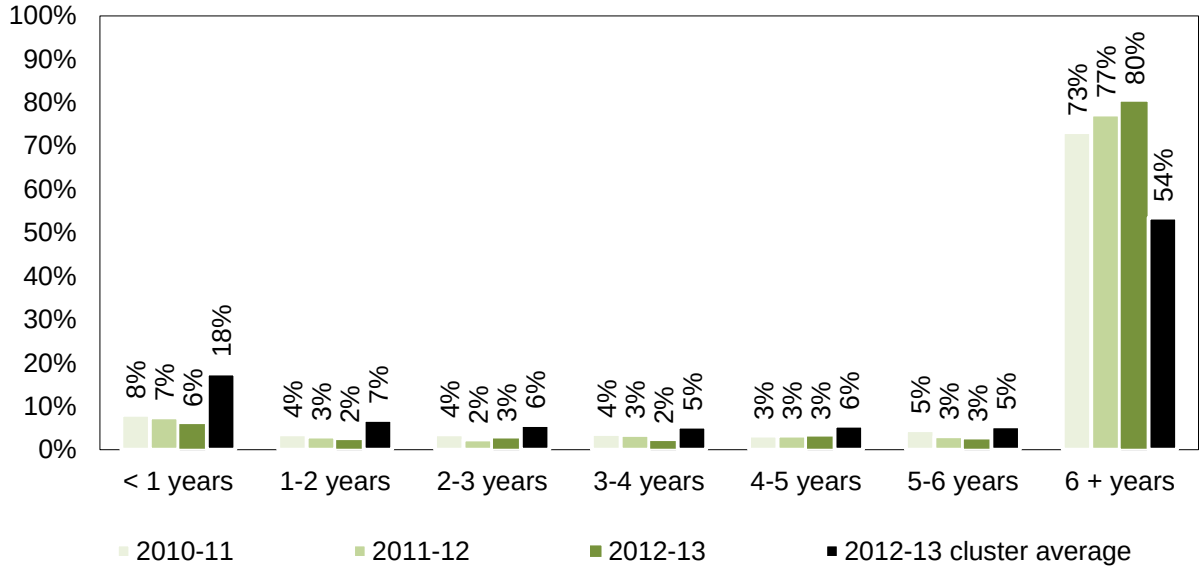
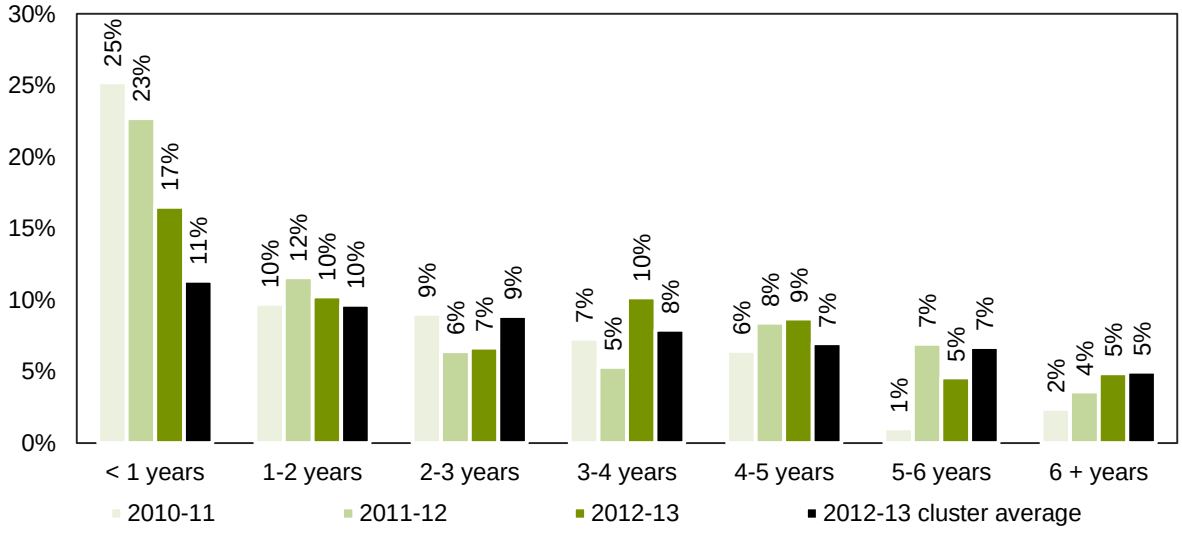
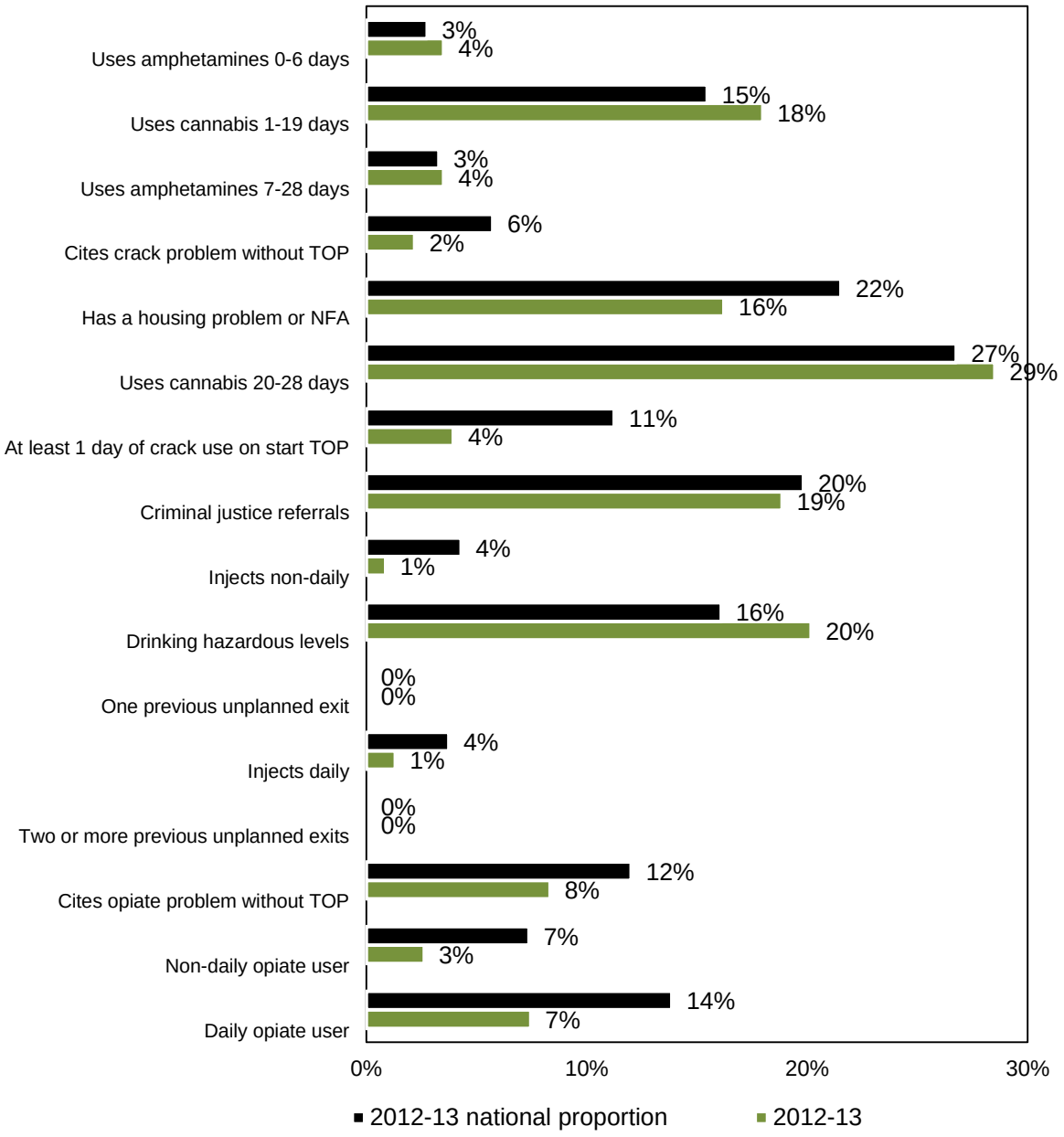


Figure 52. Completion rate by time in drug treatment, Wirral vs. cluster, 2010/11 to 2012/13. From NTA (2013).



In terms of complexity of drug problems, Wirral is below the national average for most complexity indicators, which indicates a high number of people who are relatively stable in their drug behaviour.

Figure 53. Prevalence of complexity indicators for individuals in drug treatment, Wirral vs. national 2012/13. From NTA (2013).



The spread of blood borne viruses is a risk in the drug using population, as viruses can be spread through sharing needles and also drug users are more likely to work as commercial sex workers or to engage in risky sexual behaviour. Blood borne viruses can also potentially be spread by sharing crack smoking equipment or by snorting cocaine with the same bank note or key as someone else. The blood borne viruses that drug users are most at risk from are HIV, hepatitis B and hepatitis C. Hepatitis B is much more infectious than hepatitis C but hep C has no vaccine available. Hepatitis C was not really known about until 1989 with a test developed in 1990. Hep C is around 10 times more infectious than HIV, so it is a lot more prevalent than HIV in the drug using population.

Hepatitis C infection in the general population is estimated to be 0.67% (Harris et al., 2011). According to estimates from the Health Protection Agency (HPA), Wirral has a prevalence of 46% of injecting drug users having hepatitis C so around 70 times greater than the general population (HPA, 2012). However there is a lot of uncertainty around this estimate, with 95% credible intervals of anywhere between 20% and 70% prevalence. This estimate means that Wirral was categorised as being a medium prevalence area for hepatitis C virus in injecting drug users (medium is where prevalence is between 40% and 60%, low is where prevalence is less than 40% and high is where prevalence is above 60%). This indicates that most long term injectors are likely to have hep C antibodies but that most new injectors most likely do not have hep C. Local testing data suggests that prevalence of hepatitis C in drug users who have been tested was likely to be around 31%, compared with 64% across the North West. Hepatitis B prevalence was around 1.5% compared with 29% across the North West. Spread of HIV through injecting drug use was estimated to be low in Wirral, with around 3% of 138 people living with HIV in Wirral having contracted the virus through sharing needles. The fact that Wirral has lower prevalence of blood borne viruses than their neighbours can be seen as indications of the success of the harm reduction model, which involves educating drug users, and providing needle and syringe exchanges and other drug treatment interventions. In some places like Edinburgh and Dundee, HIV rates in IDUs were much higher (Davies et al., 1999).

Nationally the prevalence of hepatitis B in people surveyed who inject drugs fell from around 60% in the early 1990s to around 45% in 2013, and hepatitis C from around 42% to around 16% in 2013 (PHE, 2013). HIV rates in drug users have fluctuated between 1 and 1.5% (though are around 4 times higher in London) but are much lower than most other European countries (Latkin et al., 2001). Nationally there were two spikes of increased HIV transmission, one in the mid 1980s when heroin and HIV first took off and little was known

about HIV, and one in around 2005 which was probably associated with the crack cocaine outbreak (Harris et al., 2011)

Drug policy in the UK is led by the Home Office. Drug treatment strategy was previously led and monitored nationally by the NTA (National Treatment Agency for Substance Misuse) which was formed in 2001, which from 2013 was moved to Public Health England. From 2013, local drug and alcohol services now fall under Local Authority Public Health teams. The UK Government's drug strategy was published in 2010 (HM Government, 2010b) and focuses on recovery rather than harm reduction. The government have stated that recovery is based on three principles; wellbeing, citizenship and freedom from dependence. For heroin users, having long term treatment with methadone or other substitution drugs is now out of favour, and getting clients to be in a position where they abstain completely is now the desired outcome. This means that clients who have been prescribed methadone for several years and have been stable are facing renewed attempts to get them totally drug free. The government have developed funding models that incentivise the best outcomes for both individuals in treatment and wider society by using a Payment by Results (PbR) approach with the risk that by focussing entirely on outcomes that providers are paid for this can have an effect of 'crowding out' other important outcomes or added value of services. A recent international review of pay for performance suggested that paying for processes rather than outcomes could hold more promise (Hull & Ritter, 2014).

Because Wirral has one of the oldest drug using populations, it is one of the first areas where people in long term drug treatment are starting to die in great numbers from chronic diseases. Wirral was a pioneer in harm reduction and getting heroin addicts to stabilise their lives, and reduce their levels of crime and risky behaviour (Ashton & Seymour, 2010). Although services would always want clients to ultimately recover and become abstinent, it may be difficult for clients who have been stable (some interviewees used the word 'parked') on methadone for over 10 years. Some staff from services in Wirral who were interviewed for this evaluation said that recovery was not always possible with some clients whose drug use had become entrenched, and that for these clients some small victories like moving them from injecting to smoking heroin should be recognised. Certain experts have pushed more for abstinence-based recovery rather than offering people harm reduction or maintenance (Gyngell, 2011) whilst others have argued that drugs should be decriminalised or regulated (Transform Drug Policy Foundation, 2009) as this would bring in tax revenue and reduce the risks associated with drugs being contaminated with adulterants. In Portugal drug use has been largely decriminalised and the most dangerous drug use has fallen. Conversely making drugs illegal may actually increase their attraction as in the case of ketamine where the

numbers of people using the drug increased after it was made illegal in 2006. In August 2013 the Chief Medical Officer for England said that drugs are a medical problem that society is choosing to treat as a criminal justice issue (Press Association, 2013). Drug policy is a very controversial area of policy and in 2009 the UK Government sacked Professor David Nutt who was the chair of their own Advisory Council on the Misuse of Drugs (ACMD) after a string of disagreements on the relative risks of cannabis, ecstasy and other drugs.

Wirral ranked 143rd out of 149 local authorities for premature mortality from liver disease (data for 2009-11) and a rate of alcohol-related deaths that is 80% higher than the national average (PHE, 2014a). A report looking at drug related deaths (Beynon et al., 2013) found that nationally, deaths that were directly attributable to drugs and alcohol had fallen in men but increased in women from 2009 to 2011. In Cheshire and Merseyside the number of older drug users (defined as aged 40 and over) in drug treatment has increased from 750 in 1998 to 6,500 in 2010/2011 so there are a lot more older clients than there used to be and therefore a lot more clients who have a higher risk of death (NTA, 2013).

There were 95 people recorded in the NDTMS system as being in contact with a Wirral-based service and confirmed dead over the 8 years between 2003/04 and 2011/12; 75 men and 20 women. Most had been in contact with treatment for over 5 years. The median age of death was 44.25 so quite a lot lower than normal life expectancy of 77 for males and 80.8 for females in Wirral. This is higher than the average age for drug related deaths of 28 years in 1992 and 35 years in 2000 which indicated a lot more people were dying of drug overdoses rather than longer term damage in these years. 81 of the deaths from 2003-2012 were non-drug related, though 13 were from alcohol-related liver damage and 14 were from cancer and 15 from respiratory disease, many of which were likely related to smoking. This highlights that drug users have a competing set of causes of death, so while the drug use may be brought under control, alcohol and smoking are still common causes of early deaths, and having a body that is already damaged by years of drug abuse makes individuals more vulnerable to other diseases. Long term opiate substitution use has been linked with heart problems, particularly the drug LAAM (Levacetylmethadol) which was withdrawn from the market in 2001 (Wieneke et al., 2009). Oral methadone typically contains a lot of sugar so people on high doses are at risk of diabetes, but this is complicated by the fact that people who are opiate addicts generally prefer sweet tasting food as it activates similar reward mechanisms in the brain (Colantuoni et al., 2002). Because people who are ill are most often transferred to the care of the Harm Reduction Unit, services who were interviewed reported that people in Wirral are probably more likely than people in other parts of the country to be

classed as in treatment when they die. The Harm Reduction Unit provides palliative (end of life) care to very sick clients and encourages continued engagement with services.

Table 39. Deaths recorded for current or former drug treatment clients in Wirral, 2003/04 – 2011/12. Data from Beynon et al. (2013).

Cause of death	Number	%
Certain infectious and parasitic diseases	8	9.9
Neoplasm	14	17.3
Diseases of the circulatory system	12	14.8
Diseases of the respiratory system	15	18.5
Diseases of the digestive system	18	22.2
Other	4	4.8
Codes for special purposes	2	2.5
External causes of morbidity and mortality	8	9.9

Local Data on Drugs and Crime

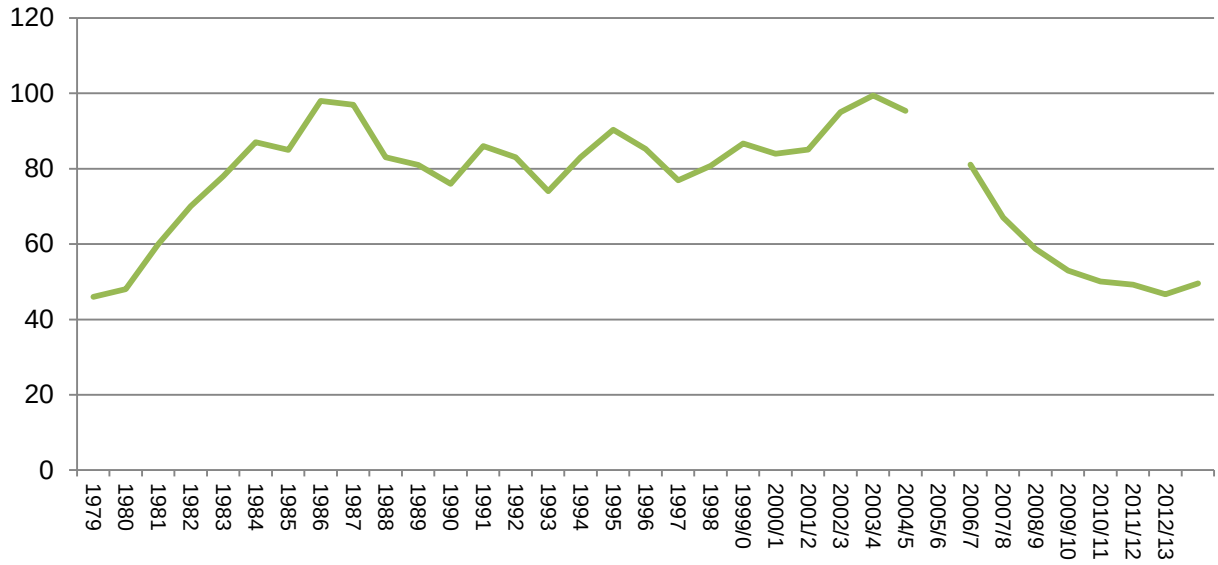
The majority of available data on drugs and crime was short term performance type data rather than longer term strategic intelligence. Crime has fallen in Wirral since the crime wave in the 1980s that was directly associated with the heroin outbreak, with crime peaking in 1996 and in 2003/04 (Figure 54). In the mid-1980s, it was reported that around 50% of people arrested for burglary in Wirral were opiate users (Parker et al., 1988). The volume of acquisitive crime, particularly burglaries, is caused by an interaction between the number of people with criminal careers, individual need to commit crime (such as to fund drug use or to pay off debts) and the ease at which objects can be acquired and subsequently sold on. The number of craved items that can be easily stolen and sold on has increased in recent years with many people having laptops, portable music players, vehicle satellite navigation systems ("sat navs") and tablet computers, but at the same time the resale value of other items like DVD players and televisions has decreased (Yapp, 2010).

Deposited syringes, street dealing, crack houses, aggressive begging, and public drug use are examples of antisocial behaviour associated with drug use. Although alcohol is related to violent crime (Toomey et al., 2012), the relationship between drugs and violent crime is less established. The theory of the pharmacological effects of drug use causing violence is widely disputed, but violence around disputes between drug dealers or violence to accompany crime such as robberies is more common (Nutt et al., 2010). In Wirral the police believe there is evidence for a link between cocaine use and violence in the night time economy; however it is difficult to unpick because there are common causal factors for cocaine use

and violence and much of the observed affect may be because cocaine use allows people to drink a lot more alcohol. Gun crime is rare in Wirral, with 13 in 2011/12 and 4 in 2012/13, and knife crime is lower in Wirral than in other parts of the country with 52 incidents in the year from September 2012 to August 2013, which was 31% lower than the year before (ONS, 2015d).

Before 1988, very few cases of possession of controlled drugs were recorded in crime figures so there was a big increase in drug-related crime post 1988. There have been other changes to crime recording over the last 20 years which may affect the figures. The age of criminal responsibility was reduced from 14 to 10 in 1998. Cannabis has been reclassified from class B to class C and back to class B again which has had an impact on enforcement. There was previously a National Indicator around drug-related crime (NI38: To achieve a reduction in the rate of Class A drug related offending over the 12 month period (18 years and over)) which might have changed policing priorities when it was removed.

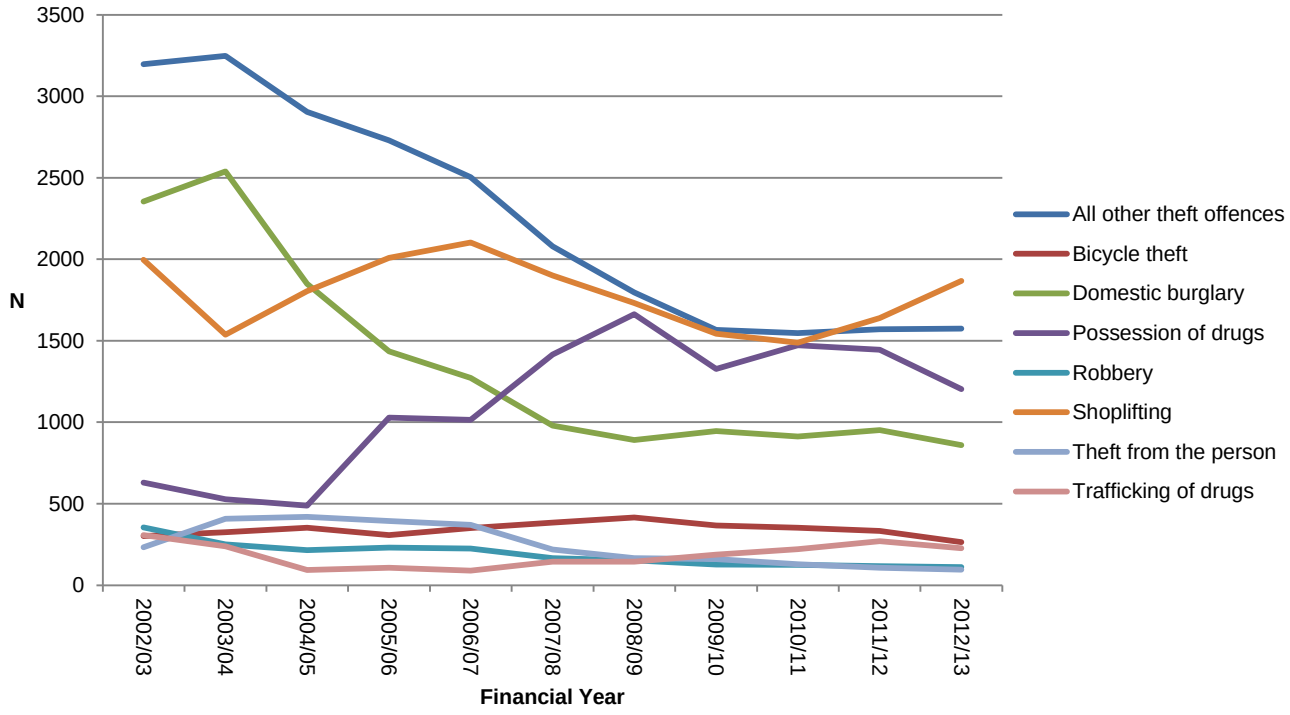
Figure 54. Annual trend in all crimes per 1000 people, Wirral. Annual data for 1979-1998. Financial year data for 199/2000 to 2012/13. No data for 2005-06 or 2006/07. From Home Office (2015).



Drug offences in Wirral have fluctuated with drug trafficking offences falling between 2003 and 2007 to around 110 per year, then reaching a higher average of around 225 per year since 2008. Since a sharp increase in 2005, drug possession offences have numbered around 1300 per year. Other parts of the country did not see a similar increase between 2004 and 2005 and it was reportedly due to a change in policing emphasis around drug-related offending in Wirral. In terms of acquisitive crime, domestic burglary has fallen more than 50% since a high in 2003 to plateau at around 920 per year. Robbery has shown a

downward trend, falling by around two thirds from 354 between in 2002/03 to 111 in 2012/13 while theft from the person has fallen by around three quarters from 407 in 2003/04 to 95 in 2012/13 (Home Office, 2015). These big improvements in rates of acquisitive crime could be partly attributed to the response to the drug epidemic (Ashton & Seymour, 2010).

Figure 55. Trend in theft and drug offences, Wirral, 2002/03 – 2012/13. Police recorded crime data. Data from Home Office (2015).



Criminal behaviour is recorded with drug treatment clients as an outcome in the Treatment Outcome Profiles (TOPs) although it is unclear how reliable this is as it is self-reported. In general ARCH dealt with drug clients who were actively committing crime. For example if a client being seen by the CWP Drug Service was arrested once, they would be kept under CWP but if they were arrested twice, they would be transferred to ARCH services, at least until they are felt to be less of a risk for criminal behaviour. ARCH services use the Integrated Offender Management (IOM) framework which is known in Wirral as Compass. This approach encompasses;

- Prolific and Other Priority Offenders (PPO) – these are repeat offenders who are typically committing a high volume of crime in their communities.
- Multi Agency Public Protection Arrangements (MAPPA) – these are typically sexual, violent or other dangerous offenders who have been released from prison.

- Multi Agency Risk Assessment Conferences (MARAC) – these are regular local meetings where information about high risk domestic abuse victims (those at risk of murder or serious harm) is shared between local agencies.
- Drug Interventions Programme (DIP) – these are people who have been arrested and tested positive for drugs on arrest, many of whom are given a drug rehabilitation requirement (DRR) where they will enter drug treatment for six months.
- Deter Young Offender (DYO) – this is scheme for young offenders who have been assessed as posing the highest risk of causing serious harm to others and having a high probability of re-offending

CWP services also work within these frameworks and attend the MARACs. There are also probation interventions and 'Through the Gate' which is a mentor-led intervention for people who have served short prison sentences. In Wirral there is more of a focus on challenging drug users on their offences, and having a partnership response, focusing on the individuals, the families and the community rather than just the individual.

7.2 Drug Treatment – Available Interventions

Most guidelines and guidance documents for drug treatment do not provide rigid protocols; rather they recommend broad treatment modalities. This means that local providers have an opportunity to tailor treatments to local populations, but this provides a risk that local interpretation might miss out the crucial elements of a theory that make a treatment work. The main guidance document used by drug treatment providers in England is the NTA's *Models of Care for Treatment of Adult Drug Misusers: Update 2006* (DH/NTA, 2006). This recommended that drug services should have integrated care pathways and should consider including;

- Harm reduction interventions
- Community prescribing interventions (GP prescribing and specialist prescribing)
- Structured day programmes
- Structured psychosocial interventions
- Other structured treatment
- Inpatient drug treatment
- Residential rehabilitation
- Aftercare

There is also 'Drug Misuse and Dependence: UK Guidelines on Clinical Management' which was published by the Department of Health in 2007 (DH, 2007).

'Commissioning for Recovery' (NTA, 2010) reinforced the shift in focus of drug treatment to recovery, and reintegrating drug users into society, for example through working more closely with housing providers and employers. This document has a set of checklists for drug commissioners to check that they are meeting the NTA's competencies in commissioning services and using the best evidence and intelligence.

NICE recommend that drug treatment includes brief advice, and for opioid users include maintenance with methadone and buprenorphine (in general the evidence suggests that methadone works better than buprenorphine for keeping people in treatment). For drug users NICE recommend considering formal psychosocial interventions such as behavioural couples therapy (where couples have a 'recovery contract' where they assist in individuals becoming drug-free), cognitive behavioural therapy (where dysfunctional emotions, maladaptive behaviours and cognitive processes are targeted to achieve specific goals), psychodynamic therapy (which has its roots in Freudian psychoanalysis and focuses on unconscious thoughts, and people's negative expectations of the response they get from others), and contingency management (where clients are given stepped rewards for positive behaviours like reducing drug use or getting tested for blood borne viruses) (Connock et al., 2007).

The average cost per person in effective treatment in Wirral was £2,171 in 2012/13 which compares favourably with other areas (from local data). This does not include all spend on drugs as there was some additional money which came from Wirral Council. In the last nine years the highest number of people in treatment was in 2005/06.

Table 40. Funding and numbers in effective treatment, Wirral, 2004/05 to 2012/13.

	2004/05	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
Adult Pooled Treatment Budget (£)	1,704,000	2,273,903 + 565,912- DIP	3,010,591 + 614,860- DIP	3,356,491 + 533,240 - DIP	3,503,490 + 533,240- DIP	3,978,411 + 533,240- DIP	4,427,558 + 533,240 DIP	4,285,799 + 506,578- DIP	4,366,217 + 491,721- DIP
Local funding (£)	0	85,000- ROB 52,000- SSCF 132,000- PSG	60,000- ROB 61,526- SSCF 132,923- PSG	138,795- PSG	105,000- PSG	127,747- PSG	0	0	0
Total funding (£)	1,704,000	6,033,630	3,879,900	4,028,526	4,141,730	4,639,398	4,960,798	4,792,377	4,857,938
Number of adults in effective treatment	2950	3145	2559	2676	2602	2448	2400	2355	2237
Total treatment funding per adult in effective treatment (£)	577	1,918	1,516	1,505	1,591	1,895	2,066	2,034	2,171

DIP= Drug Interventions Programme. ROB = Restrictions on Bail. SSCF = Safer & Stronger Communities Funding. PSG = Partnership Support Grant

Wirral commissioned specialist drug treatment services from CWP, needle & syringe exchange from CWP, and Daycare, Aftercare and criminal justice services from ARCH. There are also engagement services from Phoenix, residential rehabilitation from Phoenix House, housing projects with Forum Housing, women's project coordination, and Hep C nurse specialist and substance misuse liaison nurse from WUTH. There are some residential recovery services that are commissioned or spot purchased. There is Intuitive Recovery which is a recovery programme which changes clients' perceptions of themselves as addicts and teaches them that they have a choice. Wirral also commission community drugs engagement services from the Social Partnership, 1 to 1 community rehabilitation from the Independence Initiative, the intensive day recovery SHARP programme from Action on Addiction, and SPIDER which is an abstinence-based self-help rehabilitation programme. There are also back to work and mentoring services from The Social Partnership and Wirral Council for Voluntary Services.

Wirral commission alcohol prevention, assessment and education work which is delivered in schools by Response. There is also peer education delivered by young volunteers commissioned through Connexions. Young people aged 17-21 are trained to deliver these educational and prevention messages to young people aged around 14. Because the age gap between the two groups is not that big, these peer-delivered messages are felt to have more relevance and are structured in a way to appeal more to young people than messages delivered by a teacher or other older adult.

There was also a school drugs adviser, who worked both proactively and reactively in schools, and there was a drugs policy document which was given to schools. In the four year gap since the last school drugs adviser post, schools had dealt with drug-related incidents either through Response or through the police, or have developed processes and policies themselves within the ethos of the school. The Department for Education (2012) and the Association for Chief Police Officers (ACPO) have produced drug advice for schools. There are other services delivered in the voluntary sector like Fellowship services (Narcotics Anonymous and others). Clients and people working in services believed that Fellowship has a role to play but is not for everyone. The spend breakdown is shown in Table 41. The figures do not include all management or evaluation costs, or police crime and disorder spend, or national spend by agencies like the NTA or Public Health England.

Table 41. Breakdown of Wirral drugs budget, 2012/13 financial year.

Category	Total
Structured Community Based Drug Treatment	£3,765,377
Residential drug treatment	£548,569
Harm reduction	£411,549
Commissioning	£393,881
DIP / Drugs and crime	£303,902
Open access interventions	£299,599
Drug information & advice	£161,679
Back to work and mentoring	£140,640
User involvement	£58,106
Training	£38,030
Dispensing costs	£1,068,000
Prescription costs	£591,047
Total	**£7,780,380**

Source: Wirral council finance.

People in drug treatment services are often prescribed substitute opiates; mainly methadone and buprenorphine [subutex or known to clients as 'subbies']. Methadone (methadone maintenance treatment) is prescribed in liquid form and is initially supervised, where the client will come to the service or to a pharmacy once a day and take their dose of methadone in front of a worker. Both methadone and buprenorphine have the capacity to be abused by being injected, and both have the capacity to be sold or passed on to other people. Services in Wirral did not generally prescribe Suboxone, which is a mixture of buprenorphine and naloxone which has less abuse potential as it does not produce a high when injected (although can still be insufflated [snorted] to produce a high). The Harm Reduction Unit in Wirral has started giving some users prophylactic naloxone, which can be used to reverse the effects of an opiate overdose. They encourage people in the case of overdose to administer naloxone, call 999 and stay with the person until they are handed over to paramedics. Anecdotally two people have been revived from overdose so far, although it not possible to be sure what would have happened without naloxone. Wirral also prescribes morphine and diamorphine [heroin] in some cases where clients had been transferred from other services and were stable on these drugs. Other drugs such as antidepressants, antipsychotics, anticonvulsants, ADHD drugs, and benzodiazepines (which are anti-anxiety or sleeping tablets) were also prescribed for people in drug treatment. The amount of sugar in methadone is a risk for dental problems, and methadone also causes dry mouth which can lead to plaque formation, so oral health monitoring is important. The drug dispensing costs were high at £1,068,000 for the year because of a high number of clients who require supervised consumption, i.e. they have to drink their methadone dose while the pharmacist is watching to ensure it is not diverted. Table 42 shows the number of items and

spend on schedule 2 drugs like morphine and methadone, and schedule 3 drugs like buprenorphine for Wirral.

Table 42. Number and cost of items prescribed by community drugs teams and shared care, Wirral 2012/13 FY (Data from Wirral Clinical Commissioning Group Medicines Management Team, 2013).

BNF Name	Number of Items	Actual Cost
Schedule 2 controlled drug	39,505	£465,018
Schedule 2 controlled drug – Injections	1,462	£58,428
Schedule 3 controlled drug	3,226	£65,994
Total	42,731	£531,012

CWP Services

At the time of writing this, Cheshire & Wirral Partnership NHS Foundation Trust (CWP) was the main provider of drug and alcohol treatment services for Wirral. Previously alcohol and drug treatment was separate, however now CWP reported that they had integrated teams. This change mainly involved 'skilling up' alcohol workers to also deal with drug clients through training and shadowing. CWP provide outreach and engagement, harm reduction, syringe exchange, detoxification, structured drug treatment and services targeted at vulnerable people, commercial sex workers, pregnant women, people with severe mental health problems, people with personality disorders, younger clients, and prescription drug users. They also have a hepatitis B nurse and staff who work with homeless and hostel dwellers. They work to support people who are at risk of being made to leave hostels due to their challenging behaviour. In 2013 a separate evaluation of the homelessness nurse was carried out which found that this service was cost effective (Collins, 2013b). CWP have a member of staff who deals with service veterans who may have picked up drug habits when stationed abroad or have drug use that is associated with post-traumatic stress disorder (PTSD). They have engagement workers who go into the community to find clients who have withdrawn from engaging with services. CWP also subcontract aftercare services from the Olive Branch. An evaluation of the first 12 months of the Olive Branch was completed in January 2014 which said that 46 people had completed the programme as of November 2013 and 21 were drug free. Clients said the programme was beneficial in providing intensive support, increasing their awareness of recovery and opportunities and exposing them to people who had recovered from drug addiction. Clients reported that the things they

appreciated about the service were that the coaches were approachable, believed in them and texted them every day (Karpusheff & Honor, 2014).

The total spend on drug services provided by CWP was £3,073,005 in 2012/13. CWP reported that any revenue they saved had to go into efficiencies as part of their 4-5% cost improvement programme (CIP). This had meant stripping non pay costs, reducing travel costs, and downgrading and losing posts.

CWP have a team who are involved in safeguarding, women and domestic violence which deal with families who may have safeguarding issues around care of children when they are using drugs and alcohol, and safe storage of drugs. When interviewed for this evaluation, staff reported that domestic violence was increasing in drug and alcohol users as more couples and families drink at home "until they get fed up with each other". The service do home visits and work with social services. They also do outreach work with commercial sex workers on the streets and in parlours. This involves providing advocacy, condoms, and advice on safety, including the national 'Ugly Mug' scheme which shares information about violent and abusive customers. Commercial sex workers will often use drugs to make their work more bearable, or will be working to pay for drugs, often crack cocaine. They reported that there were 'quarterly girls' who work to pay their bills every three months. They reported that Wirral's street sex working scene is smaller than it used to be, but is still there. This team are the main service in Wirral for helping commercial sex workers. The safeguarding team have links with the Family Safety Unit and go to the MARAC (Multi Agency Risk Assessment Conferences) to talk about domestic violence cases. They often deal with cases of co-dependence, where people are in relationships which are mainly founded on sharing drugs and do not want to be together otherwise.

The harm reduction unit provide palliative care services and see clients with some of the most severe health problems. They have non-medical prescribers who can prescribe for some illnesses. They reported that they operate like a walk-in centre and see some of the most vulnerable people who often do not access other services. HRU staff gave an example of self harmers who would come into the unit to get their wounds cleaned up. They give out food vouchers and homeless packs for people who are sleeping on the streets. The harm reduction service also provide community alcohol detoxification for clients who would not be appropriate for residential detoxification in Birchwood. Services said that being co-located at the St Catherine's site with dental, heart, X ray and other services was beneficial. Services said that having direct referral pathways for pregnancy, sexual health, stoma, TB, pain management and other health issues meant that they could be part of seamless care

provision. Heavy opiate use often stops menstruation which means that pregnancies can go unnoticed for several months which can be very risky to the unborn child.

CWP services said that some of the main benefits of their work were keeping people from having unnecessary healthcare activity (GP consultations, A&E presentations and hospital admissions) and maintaining drug users in the community. Services said they had a very good relationship with GPs and with pharmacists, who were their "eyes and ears on the ground". Smoking is common in drug users and is a big cause of death. All staff have level 1 and some have level 2 smoking cessation training and provide smoking advice. They recommend Champix as a stop smoking aid to clients as working in the same way as Subutex (it is a partial agonist so partially stimulates the nicotine receptor while blocking it).

Needle & Syringe Exchange

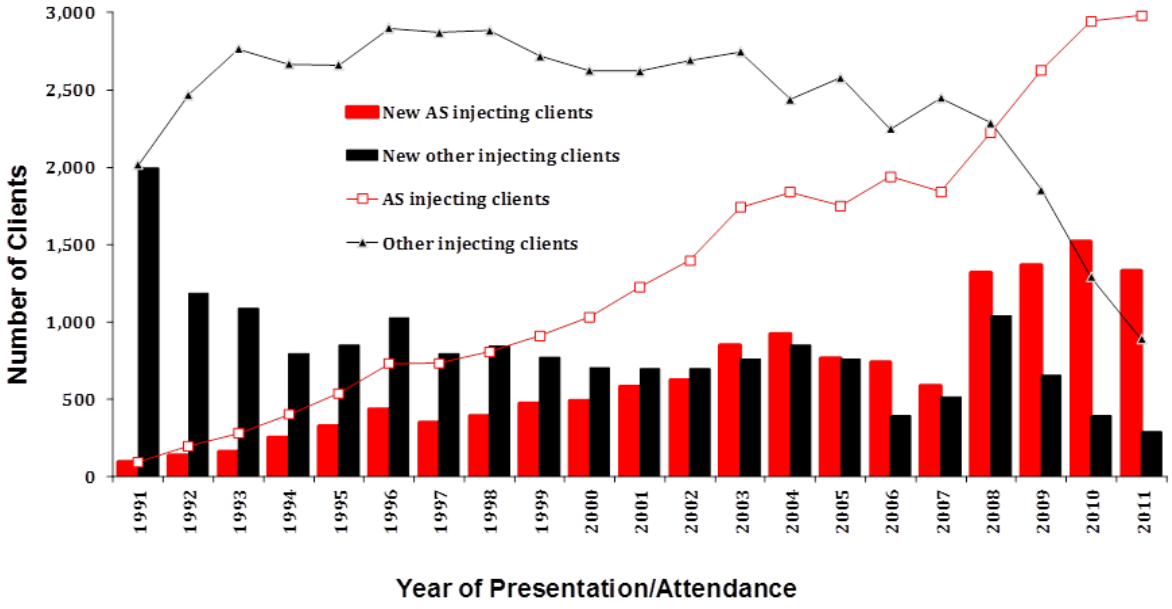
Wirral had one central needle exchange service based at the Harm Reduction Unit at St. Catherine's and also had needle exchange services based in 14 pharmacies. Nationally around 8% of pharmacies provide needle and syringe exchange services. The Harm Reduction Unit allowed needle and syringe users to choose from a broad range of needles, whereas the pharmacies had a more narrow selection. The HRU carried out injecting assessments and would warn clients about the legalities and follow up on any public health alerts around steroids. Pharmacies believed that they mainly saw heroin clients, but data showed that some of the syringes they provided are greater than 1ml which would indicate they are more likely to be being used by steroid users. Data on needle & syringe programme (NSP) clients is available from the Inter Agency Drug Misuse Database (IAD) which is reported on regularly by the Centre for Public Health at LJMU. The HRU was provided by CWP and had a separate entrance to the rest of the drug service so that people on methadone who were also injecting heroin would not be deterred from accessing the needle exchange through the fear that they may encounter their key worker in the corridor and it would be clear that the client is still injecting.

There is good evidence that needle exchange programmes are effective and cost effective in preventing HIV transmission in injecting drug users, especially when there is also good coverage of drug treatment services present (Degenhart et al., 2010). In an economic model commissioned by NICE in 2008, increasing coverage of needle & syringe programmes such as through vending machines, and recruiting people who use needle and syringe exchanges into opiate substitution therapy, and recruiting injecting drug users into hepatitis C treatment were found to be broadly cost effective with incremental costs per QALY of less than £20,000 (Vickerman et al., 2008).

Nationally needle sharing had decreased but around 1 in 7 injectors still reported sharing needles. Wirral had a lower prevalence rate of blood borne viruses like hepatitis B & C than similar local authorities, which was one indication that needle syringe programmes have been successful in preventing viral transmission.

There were principally two groups who use needle exchanges in Wirral; these were heroin users who were mainly aged over 40 and had been using services for a long time, and steroid users who were mainly younger, almost all male, and may not have be known to drug treatment services. In the North West, numbers of performance and image-enhancing drug users (PIEDs) accessing needle and syringe exchange services have increased steadily since 1991 (Figure 56) (Evans-Brown et al., 2012). Staff from the HRU said that young men would previously start on oral steroids so the average age of injectors used to be around 25, but now young men aged around 17 were going straight into injecting steroids. These users are at a greater risk of blood borne diseases than was previously thought - it was previously believed that they were much lower risk than injecting opiate users, but because many of these clients have high numbers of sexual partners and low condom use they are at risk from this as well as needle sharing (Hope et al., 2013). Steroid use is high in young gay men as well, who usually have higher rates of HIV than heterosexual men. One drug service member of staff highlighted a potential risk of older heroin addicts who may have BBVs "hitting the gyms" and sharing injecting paraphernalia with other users. There have been reports of injecting rooms in gyms in Wirral, and that steroid injectors think that as long as they use their own needle they cannot catch BBVs, not realising the risk from sharing a syringe. The service talked about one case of a man in his 20s who had developed some breast tissue from steroid use, and was identified through the service as having breast cancer, which had been prevalent in the women in his family. This person may have died if he had not been engaging with the harm reduction unit. In their draft updated guidance on needle and syringe exchange programmes, NICE have recommended that NSPs should offer outreach or detached services in gyms for PIEDs (NICE, 2013a). The HRU reported they wanted to do more outreach work in gyms.

Figure 56. 'All' & 'new' clients attending agency based NSPs in Cheshire & Merseyside (1991-2011). AS = Anabolic Steroid



Source: This chart is from Evans-Brown et al., 2012.

Based on data for Q3 2012/13, 97% of new clients presenting to needle exchanges were male, and 57% were aged below 30. In Quarter 3 2012/13, 33,061 syringes in total were provided (21,189 in the HRU and 11,872 in pharmacies). Clients can give false details so the database may not always pick up new clients accurately. There has been some cross-matching done to compare between the needle & syringe programme clients and the NDTMS and around 10-20% of NSP clients are cross-matched with drug service data (most steroid users were not in drug treatment). There have been 14 new clients over the 12 months who use melanotan, which is an illegal synthetic hormone injected as a skin tanning agent.

ARCH Services

Unless otherwise references, this information is based on semi structured interviews with managers and staff. ARCH started providing services in 1985 when Wirral Council moved investment from what had previously been Merseyside Drugs Council and invested in setting up ARCH as a separate service in Wirral, initially with six counsellors. ARCH provided drop in services, structured counselling, training, family support and aftercare services as well as the criminal justice and drug testing services and residential detoxification at Birchwood. They also provided a stimulant service, a family service, young adult service and outreach and home visits to family service clients. In 2012/13 spend on drug services provided by

ARCH was £1,414,958 for Wirral (Wirral finance data), although many of these services are for people with primary alcohol as well as drug problems. With the loss of a Wirral Council grant, and with the end of lottery funding, ARCH had their income reduced by around £325,000 from March 2013 and closed their Aftercare building, meaning that Aftercare was geographically located next to the other treatment services. Service staff interviewed for the evaluation said that this possibly a risk as people who are further down the road to recovery are mixing with people who are still using drugs, but can also be seen as a positive as it means that services can work together more closely and people in recovery can act as role models to people who are earlier in their journey. The entrance to the aftercare and alcohol services is located through a café which was set up to remove feelings of stigma or trepidation for people going into the building.

ARCH provided social interventions that help people who are recovering from addiction to do something productive with their time; crack and opiate users are often shunned by society so helping them to become more confident, interact and increase their self-esteem is important in helping them to become drug free. Keeping people busy, helping people to deal with cravings and reinforcing positive behaviour is a part of this. Helping clients to reintegrate into the real world and find hobbies and interests is useful in staving off boredom. For some clients who had moved away from their home situation so that they could stay drug-free, making new friends was important. Staff in ARCH reported that with a reduced amount of resource, they were now less able to provide some activities such as drama, arts and crafts, and outdoor sports which were useful in getting clients to mix with people, find new hobbies and keep busy. People in the general population do not generally access these kind of enjoyable activities for free though, so there is a debate about what should be provided as part of drug treatment. ARCH worked with housing trusts to try to help clients improve their housing situation. ARCH also helped clients to write CVs for job applications and to learn IT skills. With continued lack of job opportunities, and changes to social benefits such as people getting benefits monthly instead of weekly, and the changes to the spare room subsidy [known as the bedroom tax] there had been a reported increase in clients who are getting more desperate, such as stealing to buy food. ARCH also reported that with changes in social care funding they were having to do more social care type work, and that it could be difficult to get clients to be assessed by social care as being vulnerable adults. They gave an example of a man who had a place in a hostel but instead slept in a bush every night because he was being bullied by other residents and had mental health and self-harm issues, yet they could not get him assessed as a vulnerable adult. ARCH's family services support up to 50 families, and work closely with social care and the Intensive Family Intervention Project (IFIP) and go to joint case conferences. They work intensively with

families in the home on improving the drug and alcohol aspect of their lives. They reported how it can be very emotive work as they have to report any signs of neglect and sometimes children are removed. Staff from ARCH reported that they would prefer to see more referrals for families before children are removed.

Clients using ARCH over 2 years were parents to an estimated 2,900 children which indicates that clients need extra support for things like childcare which ARCH support through their family service. This also indicates that drug treatment can be cost effective in helping parents to beat their addictions and be able to keep children who may otherwise end up in care. Wirral has high rates of looked after children, which may partly be a legacy of decades of social and drug problems. Staff said that they use techniques such as the NTA's ITEP (the International Treatment Effectiveness Project) which is a set of techniques for structured psychosocial interventions centred on mapping out where clients want to see improvements in their lives. Services also use motivational interviewing techniques.

Staff from ARCH said that with more resource they could provide better cover when people are on sick and maternity leave; they raised the importance of this cover for tracking crime in drug users who were in some cases prolific and persistent offenders (PPOs) or dangerous criminals. They said that there was no funding to send clients who had complex needs for residential rehabilitation ; they said that clients who were well motivated and had attended meetings were higher priority for rehabilitation but for some chaotic clients being sent away for rehabilitation in another area could be a lifesaver. More resources could allow clients to access Aftercare for longer than 6 months (it was reported that some clients get anxious about leaving Aftercare after 6 months although they can then go on to the Spider service which has activities to prevent relapse); they could market their services better so that more people accessed them, particularly people with problems with stimulants that may be anxious about accessing services. Staff interviewed from Prison Throughcare said there were issues around housing for people coming out of prison; people who were stable but on methadone were often not eligible for housing because they had to be abstinent from all opiates, but going back to hostels where drug use was rife meant they could quickly relapse back into using street drugs. Since the economic downturn and benefits changes there were a lot of people with housing needs so housing associations could 'cherry pick' from a larger pool of potential tenants which means they are less likely to provide housing to people with drug problems. Some staff questioned the value of giving drug using offenders very short prison sentences which meant that they lost their place in a hostel, would be put on methadone but wouldn't have any other intervention and then would come out of prison and have no fixed abode. As was the case with CWP, ARCH staff indicated that there were

issues with hostels turning clients away when they didn't meet their criteria or had caused problems before, and clients having to spend a long time living on the streets.

The Drug Interventions Programme (DIP)

The Drug Interventions Programme (DIP) is a part of the Government's strategy for tackling drugs. It began in 2003/04 as a programme to develop and integrate measures for directing adult drug-misusing offenders out of crime and into treatment. In this programme people who have committed 'trigger' offences such as drug-related crime such as possession or drug dealing, or crimes that are often related to drug addiction such as fraud or acquisitive crime are saliva tested in the custody suite for the presence of cocaine or opiate drugs and are then referred into drug treatment services. Since public health moved to local authorities the DIP has become optional but most areas are opting to retain it.

An individual will be tested on arrest where they fulfil all of the following conditions: are aged 18 or over; are in police custody; and were arrested for a trigger offence or for an offence where a police officer of Inspector rank or above suspects specified Class A drug use was a causal or contributory factor. Testing on Arrest enables the police to identify adults misusing specified Class A drugs earlier in their contact with the criminal justice system, so that they may be steered into treatment and away from crime as soon as possible. It has also increased the volume of drug misusing arrestees identified – providing an opportunity to screen more people at some stage of their detention - and will ensure that those who misuse drugs but are not charged with an offence are nevertheless helped to engage in treatment and other programmes of help.

7.3 Background to Case Study

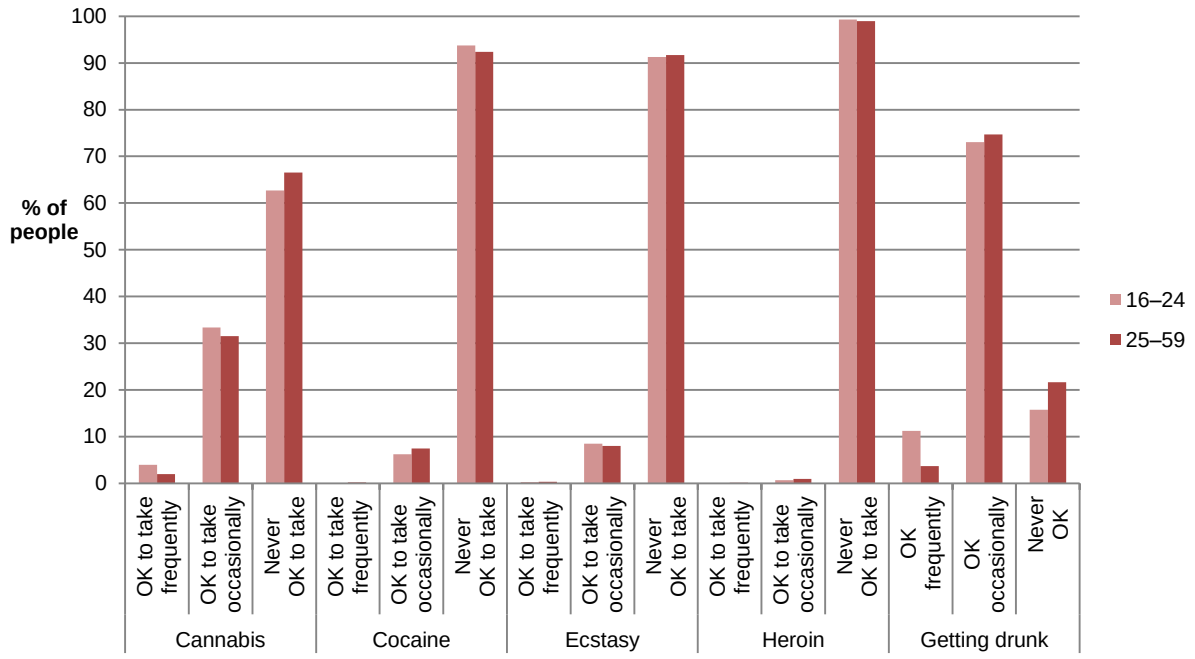
In England and Wales, around 99% of the population think that taking heroin occasionally is not acceptable, compared to 92% for cocaine and ecstasy, 66% for cannabis and 15% for getting drunk on alcohol (Home Office, 2013). Unsurprisingly people who have used drugs in the last year are more likely to rate drug use as being more acceptable or as being safe than people who have not used those drugs. Most people do not see drugs in the categories of harm, class A, B, C, that are used by the Home Office so for instance although cocaine and heroin are class A most people think that heroin is a much worse drug.

Interestingly people on higher incomes are more likely to think that taking ecstasy, cocaine or cannabis is safer compared with people on lower incomes (Home Office, 2013). Possibly this is because affluent people are more insulated from seeing the effects of drug use in their

communities, or because their actual experience of drug use in their peer group has been largely insulated from negative effects of people spiralling into addiction or having financial problems caused by drug use. This is due to the protective effect of employment, social networks and education.

Thinking about subgroups and subcultures is useful in terms of targeting harm reduction messages. A lot of drug use is related to music and other subcultures. There is a subculture of mainly older people known as 'psychonauts' who try out new drugs and usually report on their experiences. Subcultural theory and social learning theory predicts that people who are in subcultures are primed to the drugs used by their peer group, even before trying them (Golub et al., 2005). Of course even within many subgroups the majority of people do not use drugs.

Figure 57. Attitudes towards acceptability of getting drunk and taking drugs, England and Wales, 2012-13. Data for 16-24 & 25-59 age groups.



There were several drug-related indicators in the Public Health Outcomes Framework 2013-2016 (PHE, 2014a). Some of those metrics which are particularly relevant to drug treatment are:

PHOF 2.15 Successful completion of drug treatment [this is separated into opiate and non-opiate users]

PHOF 2.18 Alcohol-related admissions to hospital

PHOF 2.2 Take up of the NHS Health Check programme by those eligible (which will include screening for alcohol misuse from 2013).

2.23: Self-reported wellbeing

PHOF 4.3 Age-standardised rate of mortality from causes considered preventable per 100,000 population – includes drug & alcohol related deaths

PHOF 4.6 Mortality from liver disease

PHOF 4.8 Mortality from communicable diseases

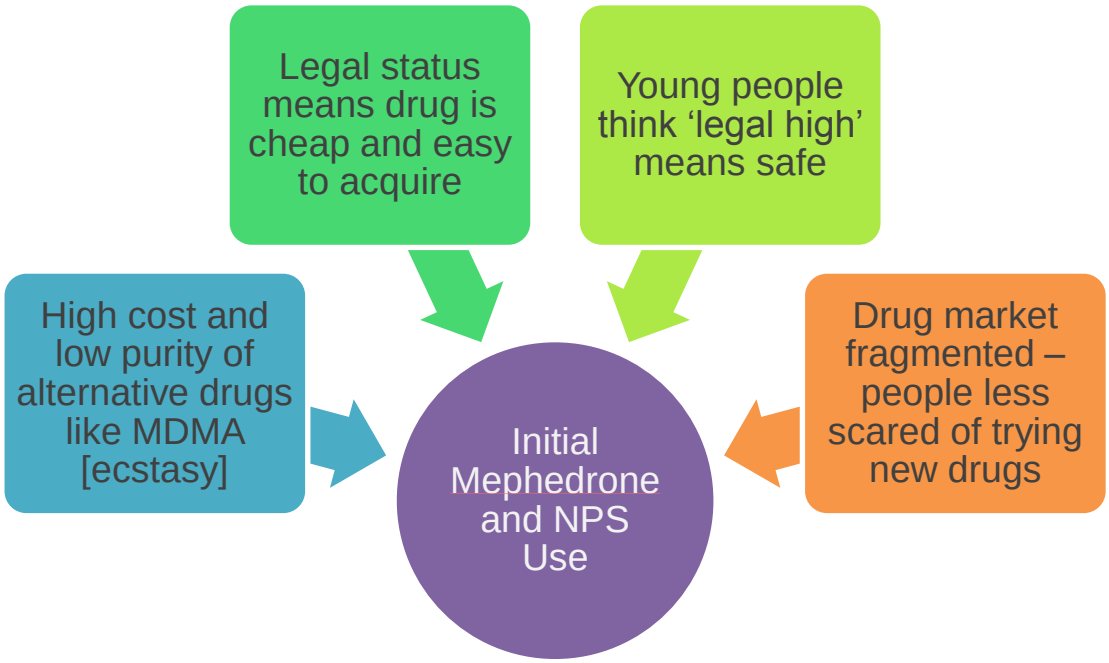
There is also 'PHOF 2.16 Proportion of people assessed for substance dependence issues when entering prison who then required structured treatment and have not already received it in the community'.

The future of the illegal drugs market

In the past five years, novel psychoactive substances (NPSs) and 'legal highs' have become much more popular with young people. Novel psychoactive substances are often purchased online from cyber-entrepreneurs (Measham et al., 2010).

There is evidence that young people mistakenly think that the moniker 'legal high' indicates that these drugs are safer than illegal drugs. Illicit drug manufacturers have been tweaking the chemical structure of illegal NPSs when the drug becomes illegal to make a new drug that is not illegal. This has led to whole classes of drug being made illegal for instance cathinones like mephedrone, or piperazines like BZP (Morris, 2010).

Figure 58. Predictive factors for initial novel psychoactive substance use. Produced by the author.



With most drugs there is a substitution effect, where people move onto cheaper drugs if the price of their chosen drug increases or if availability drops. When mephedrone was legal and therefore very cheap and easy to get hold of, it was used by MDMA/ecstasy users as a substitute because the average amount of MDMA in ecstasy tablets had dropped very low, and similarly with cocaine typical street purity was very low (King & Kicman, 2011). However now that mephedrone is illegal and the price has gone up, these users have gone back to their original drug of choice. There is evidence for a similar substitution effect with crystal meth, crack and cocaine, where people would only use crystal meth if the price or availability of crack or cocaine became a serious issue (Sumnall et al., 2004). There is an unintended consequence of enforcement that reducing availability of drugs like heroin or cocaine might increase prices and move people onto cheaper but more harmful drugs, or that drugs may be cut with more harmful additives.

Drug services managers said that there was a danger that as the older generation of heroin addicts are less visible, the deterrent potential is reduced (which they called the 'scarecrow effect'). Service managers said that at the moment young people have an idea of the typical heroin addict or pejoratively labelled 'smackhead' as being gaunt with pale skin and bad teeth, and injecting themselves every day. Even though this stereotype promotes stigmatisation of recovering addicts and is not always accurate, it serves a social purpose in putting young people off trying heroin for the first time. If and when this association wears off

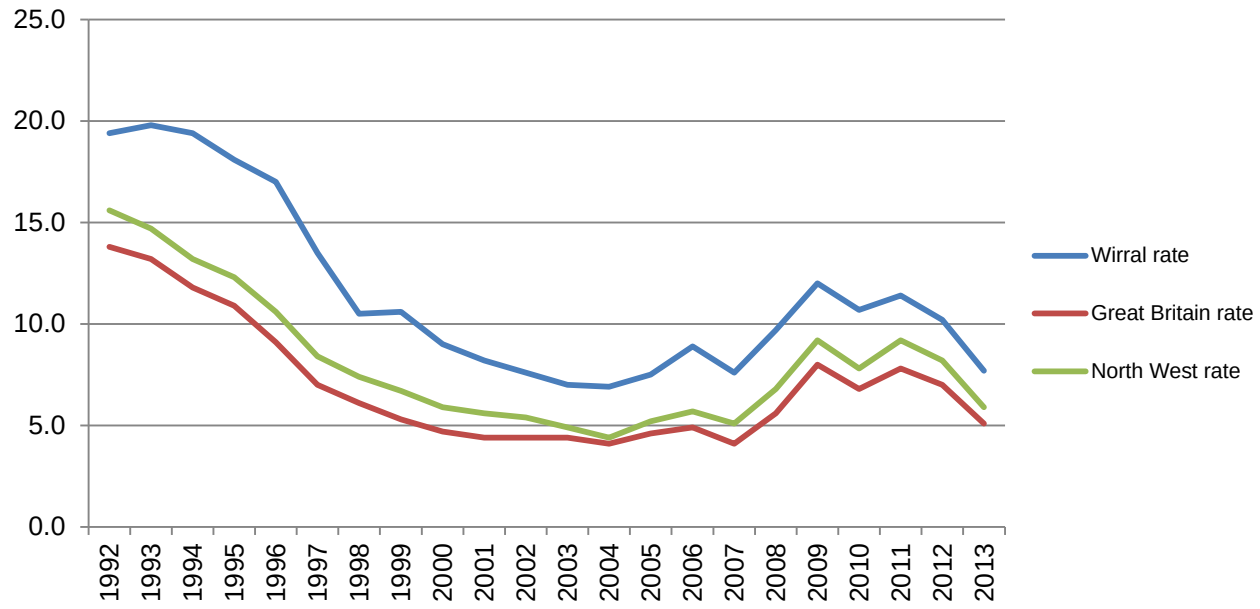
over time, it may be that there is a renewed danger of young people trying heroin and the potential for a new heroin outbreak. While opiates and crack are going out of fashion or seen as not socially acceptable with most young people, England has the highest prevalence of NPS use in Europe, continued high cocaine use, and there is always a threat that methamphetamine ['crystal meth'] which is prevalent in US cities could one day take off in the UK just as the heroin and crack era in the UK was several years after those in the US. So far recorded use of methamphetamine has been mainly restricted to gay men who often inject rather than smoke it, and because it is currently a niche drug in the UK, prices are actually higher than for other drugs whereas in the US it is cheaper than other drugs (Neptune, 2015). National numbers of people in drug treatment for methamphetamine are small but have increased steadily from 22 in 2005/06 to 208 in 2012/13 (PHE, 2014b). There is also a threat from people getting addicted to prescription drugs either diverted or bought illicitly over the internet, such as painkillers like Tramadol, which has been implicated in an increasing number of deaths, 220 in 2013, 154 in 2011 compared with 83 in 2008 (ACMD, 2013). Tramadol prescriptions have increased every year since it came on the market in 1994, reaching 7.5 million prescriptions in 2012. In Wirral the main prescription drug used by people in drug treatment is codeine, although there were 8 clients in 2012/13 with Tramadol as their primary drug. Because prescription drugs are legal, clients are less likely to come into treatment through the DIP (Drug Interventions Programme, where people arrested are tested for drugs), although opiates like Tramadol and codeine would show up on an opiate screen. Prescription drugs kill more people in the US than illegal drugs (Paulozzi, 2012). Because most prescription drugs can be bought quite easily off the internet (although sometimes they are counterfeit or passed-off drugs which makes this even more dangerous), it means that more needs to be done to identify people who are dependent or addicted to drugs prescribed to them by a doctor, as stopping the prescription will not always stop someone accessing the drugs (NTA, 2011).

There was also an increase in young people using performance enhancing drugs and anabolic steroids for training and body building (ACMD, 2011). People from the Harm Reduction Service in Wirral reported that steroid use was a ticking time bomb in Wirral which was associated with blood borne viruses (some had been found to have hepatitis C), sexually transmitted infections (most were young men who would have several sexual partners and some would describe themselves as heterosexual but would have sex with other men in the peak of their cycle), male breast formation (gynecomastia) and infertility, liver disease and cardiovascular disease. These men were often cocaine users as well and were often getting most of their information from the web; they were prone to depression and could be using a cocktail of other drugs like insulin or Herceptin.

Nationally there is also an increase in young people and students using nootropic ‘brain enhancer’ type drugs like Ritalin, a stimulant drug aimed at adults and children with ADHD, and Modanifil, a wakefulness- and concentration-promoting drug aimed at people with narcolepsy and other sleep disorders (Singh et al., 2014). High rates of youth unemployment and graduate unemployment means that many young people will try anything they can that might give them a slim advantage over their peers (see Figure 53). This might mean they are less likely to use recreational drugs because of the risks of getting arrested or having impaired performance, but are more likely to use nootropic drugs because of the chance of being given an advantage over peers. Wirral has high rates of Ritalin prescribed to young people.

In young people use of energy drinks which typically contain high amounts of legal stimulants like taurine, caffeine and guarana as well as sugar has increased over the last five years (Walker, 2015). These drinks which have a mild to moderate stimulant effect on the central nervous system may in theory prime young people for stimulant use, or be used instead of stimulants. A recent US study suggested that teenagers who drink the most energy drinks are more likely to use drugs, and that energy drinks promote an accelerated, stimulant culture (Terry-McElrath et al., 2014). The growth in young people drinking shots and shooters like vodka red bull or “jägerbombs” [jägermeister liquor and red bull] which mix the depressant effects of alcohol with the stimulant effects of energy drinks and have a similar effect to mixing alcohol and cocaine in allowing people to get ‘drunk and wired’ and therefore may be used instead of mixing cocaine or ecstasy with alcohol.

Figure 59. Trend in youth unemployment in Wirral, North West of England, and Great Britain, November 1992-November 2013 (yearly snapshot). Source: NOMIS.



These newly emerging drugs will differ in the type of problems they cause for individuals and therefore the number of people who might end up needed some kind of drug treatment or intervention. Little is known about many of these drugs, their long term effects, and how they interact with each other and with alcohol. The drug market has become more fragmented, with the cross-reactions and long term effects of drugs not being well understood. This leads to the potential danger of previously unobserved mental and physical problems in the future for individuals using new drugs. Although problems related to crack and opiate use have declined, the level of investment that is needed to deal with other emerging drug and addiction problems may need to be considerably increased.

7.4 Case Study

7.4.1 Aim

The aim of this case study was to determine whether three main elements of Wirral's commissioned services, those from CWP, ARCH and the DIP, were cost effective in improving health and reducing crime.

7.4.2 Literature review

Direct expenditure on drug services was £1.106 billion for the UK in 2010/11 (0.17% of public expenditure), while unlabelled expenditure (expenditure which is in some way related to drug abuse) was estimated as £6.265 billion, the majority of which related to public order and safety (Table 43) leading to an overall total of drug-related public expenditure amounting to £7.37 billion which was 1.1% of all public sector expenditure (Davies et al., 2012). The Home Office have estimated that each problematic drug user (PDU) costs around £50,000 per annum (Singleton et al., 2010). Drug use was estimated to cost society £15.4 billion a year, of which £13.9 billion was related to crime committed by people who are dependent on drugs (Godfrey, 2002).

Table 43. Estimates of unlabelled (non-drug specific) costs of drug use, UK, 2011. From Davies et al., 2012 p. 194.

Category	Expenditure (£m)	% of unlabelled spend	Proactive or reactive
Police – drug offences	£966.0	15.4	Proactive
Police – drug-related crime	£1,664.6	26.6	Reactive
Courts – drug offences	£266.5	4.3	Proactive
Courts – drug-related crime	£459.0	7.3	Reactive
Prison – drug offences	£637.7	10.2	Proactive
Prison – drug-related crime	£430.7	6.9	Reactive
Total public order and safety	***£4,424.5***	***70.6***	
Unlabelled expenditure on drug services from mainstream health budgets	£57.0	0.9	Proactive
Unlabelled substitution treatment prescription costs	£28.0	0.5	Proactive
Infectious disease	£47.3	0.8	Reactive
Neuropsychiatric conditions	£44.4	0.7	Reactive
Cardiovascular disease	£2.3	0.0	Reactive
Maternal drug use	£0.9	0.0	Reactive
Unintentional injuries – motor vehicle	£5.0	0.1	Reactive
Inpatient poisonings	£10.4	0.2	Reactive
Intentional injuries - suicides	£10.3	0.2	Reactive
Assault	£0.8	0.0	Reactive
Infection site wounds	£15.6	0.3	Reactive
Total health expenditure	***£222.0***	***3.5***	
Child and family social work	£1,420	22.7	Reactive
PSS – substance misuse	£27.5	0.4	Proactive
PSS – HIV/AIDS	£0.6	0.0	Reactive
Welfare benefits	£170.8	2.7	Reactive
Total social protection	***£1,618.9***	***25.8***	
Total unlabelled expenditure	**£6,265.4**	***100.0***	

Table 44. List of costs associated with drug use.

Bearers of costs/ harms	**Examples of Costs:**
Users	Premature Death, Loss of quality of life: mental and physical health; relationships; Impact on educational achievement, training opportunities. Excess unemployment and loss of lifetime earnings
Families/carers	Impact on children of drug users, Transmission of infections, Intergenerational impact on drug use, Financial problems, Concern/worry for users, Caring for drug users or drug users' dependents
Other individuals directly affected	Victims of drug driving; drug-related violence; drug related crime, Transmissions of infections from drug users
Wider community effects	Fear of Crime. Environmental aspects of drug markets – needles, effects of drug dealing in community.
Industry	Sickness absence and theft in the workplace Security expenditure to prevent drug-related crime Productivity losses. Impact of illicit markets on legitimate markets
Public sector	Health care expenditure and criminal justice expenditure, Social services, Social security benefits

Based on Godfrey, C. The economic and social costs of Class A drug use in England and Wales, 2000

In the NTA's Value for Money (VfM) Tool they estimate the national net cost per QALY (quality adjusted life year) gained for problematic drug users (PDUs or heroin or cocaine users) as £6,468 per QALY and for non-PDUs (people using stimulants, cannabis etc.) as £10,055 per QALY (PHE, 2013), before any cost savings are taken into account. Both of these cost effectiveness ratios would be considered cost effective by NICE who recommend that interventions should be adopted if the incremental cost effectiveness ratio (ICER) is less than £20,000 per QALY gained (Rawlins et al., 2010). Once the cost savings from reduced crime are taken into account, the interventions produce a net cost saving with a cost effectiveness ratio of around £5 for every £1 spent over a 4 year time horizon, and around £10 for every £1 spent over a 10 year time horizon (PHE, 2013).

In 2010, the National Audit Office (NAO) published 'Tackling problem drug use' which estimated that every £1 spent on drug treatment produced £2.50 in savings to the taxpayer. Drug treatment services have seemingly become more efficient over time with average cost per adult in effective treatment dropping by 20% from £3,600 in 2004/05 to 2008/09 (when

adjusted for inflation this drop is 31%) but over this time the drug using population has changed as well, with fewer opiate users.

Table 45. Spend on adult drug treatment, England, 2004/05 to 2008/09.

	2004/5	2005/6	2006/7	2007/8	2008/9
Adult Pooled Treatment Budget	£255m	£300m	£380m	£383m	£373m
Local funding	£226m	£226m	£224m	£207m	£208m
Total funding	£481m	£526m	£604m	£590m	£581m
Number of adults in effective treatment	134,000	145,000	164,000	183,000	195,000
Total treatment funding per adult in effective treatment	£3,600	£3,600	£3,700	£3,200	£3,000

From National Audit Office (2010) Tackling Problem Drug Use.

The Drug Treatment Outcome Research Study (DTORS, 2009) looked at outcomes for drug users (including PDUs and non-PDUs) and included a cost effectiveness element. It combined cost and activity data from the NDTMS with interview data for around 1,800 people that was used to estimate QALYs gained and resource use (health and social care and cost of offences). The QALYs were calculated using the SF12 survey instrument. There was a lot of variation around the average QALY gains. In the DTORS, the net benefits of drug treatment were positive in 80% of clients. The average net benefit ratio was around £2.50 for every £1 spent. This is much lower than the NTORS ratio of £9.50 for every £1 spent but was measured over a time period of 51 weeks compared to a 4 year time period in the NTORS, as well as there being other differences in measuring costs and benefits between the two studies (Godfrey et al., 2004).

Table 46. Estimated costs and QALYs over a 51 week period, data from the DTORS 2009.

Parameter	Without	With treatment	Net benefit
Cost of structured treatment	-	£4,914	-
Cost of health and social	£4,543	£3,120	£1,423
Cost of reported offences	£50,585	£39,967	£10,618
Total	£55,127	£43,087	£12,041
QALYs	0.63	0.68	0.05

Frontier Economics (2008) found that treatment services for young people were very cost effective in stopping young people continuing substance abuse problems into adulthood. For every £1 spent on drug treatment they found a return in investment of around £2 over 2 years and between £5 and £8 over the long term. In Wirral ARCH engages with young

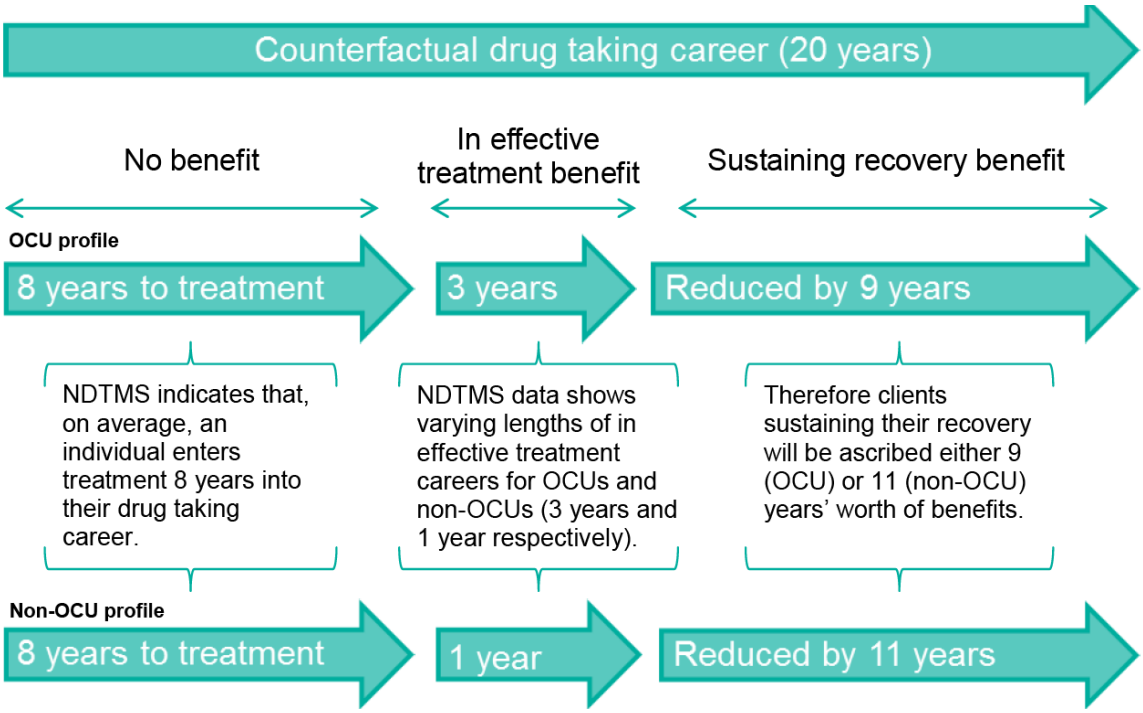
people by having cannabis education and providing harm reduction messages for stimulant and NPS users.

The NTA (now part of Public Health England) produced a Value for Money tool, working with Department of Health and Home Office economists, which includes estimates for the local cost savings that are generated by having people in drug treatment. It includes the crime and health benefits realised when people are in effective treatment (i.e. 12 weeks or more) or when people complete treatment and do not represent, a proxy for sustaining recovery. The most recent version of the tool was published in tool was last updated at the end of 2013 with 2012/13 data. The tool uses the costs for structured treatment. Overall the cost/benefit ratio was calculated as £4.77 for every £1 spent, including benefits for people in long term recovery, or £3.26 in year benefits for each £1 spent, which does not include benefits for people in sustained recovery. However this does not represent a cashable benefit; it includes the value of QALYs (Quality Adjusted Life Years) gained at £60,000 per QALY which may be considered high when NICE's threshold for willingness to pay for a QALY in a public health setting is generally quoted as £20,000 per QALY. The tool includes all adult drug users who are in effective treatment, defined as being in treatment for 12 weeks or more or making a planned exit from treatment. The tool assumes that with treatment, an individual's drug taking career is on average reduced from 20 years to 12 years. It assumes that opiate users spend 3 years in treatment on average (Figure 60). These parameters were based on the NTA report 'A long-term study of the outcomes of drug users leaving treatment' which looked at whether clients who left drug treatment in 2005/06 re-presented to treatment (measured by NDTMS) or had contact with the criminal justice system (measured by DIP drug test or Drug Interventions Record (DIR) in prison or the community) in the 4 years after they left treatment (2006-07 to 2009-10). These are quite broad assumptions that may not reflect the diversity in different populations; we know that many clients in Wirral have been prescibed methadone for 20 years or more, and were likely heroin users for several years before that. It may be that actually methadone extends drug use for many clients who may have otherwise died, or stopped using heroin on their own. In terms of the realist evaluation context-mechanism-outcome configurations, methadone might have moved from being a mechanism towards people confronting their drug use, to being part of the context, it is something that is omni-present, a baseline of opiate use that can be topped up with street drugs.

The costs in the tool include those from premature death of drug users, the impact on children of drug users, drug related crime, health care expenditure, criminal justice expenditure and social security benefits. A report by the Advisory Council on the Misuse of

Drugs stated in 2003 that between 250,000-350,000 children in the UK are affected by parental drug use (ACMD, 2003).

Figure 60. Schematic of PHE VfM drug taking career. From PHE (2013).



For Wirral the total cost of harm without any drug treatment would be £30.7m in 2012/13. The estimated spend on drug treatment was £6m which is less than the actual total spend in 2012 of £7.8million (PHE, 2013). The cost savings this generates are estimated as £19.6million per year. The tool also gives natural benefits which are based on a valuation of the QALYs gained from clients' health improvement (valued at £60,000 per QALY gained) and crime reduction (valued at £81,000 per QALY gained). These benefits are non-cashable, i.e. they would not be accrued back to the public sector, but are based on society's willingness to pay for an improvement in health or a reduction in crime. For Wirral the tool assumes 2,242 drug users in treatment for 12 weeks or more (1,856 PDUs and 386 non-PDUs) and 403 completions (166 PDUs and 237 non-PDUs).

Realist Evaluations Review

A review of realist evaluations found few that were specific to drug treatment. There was a realist review by Hunter & colleagues (2014) around barriers and enablers for drug and alcohol treatment. There was a realist synthesis by Jackson & colleagues (2014) which looked at which contexts improved psychosocial and employment outcomes for people on methadone and found that being client-centred, having positive relationships and having

ongoing engagement were all important. There was a paper by Leone (2008) which looked at a test on arrest type programme in Northern Italy. A recent paper by Davey and colleagues (2014) was a realist evaluation of a community addiction programme for urban aboriginal people, which found that the psychological mechanisms through which clients achieved their outcomes were mainly around client needs, trust, cultural beliefs, willingness, self-awareness, and self-efficacy. There was a project by the Australian Injecting and Illicit Drug Users League (AIVL, 2011) which looked at consumer participation in drug treatment programmes and used a realist methodology to determine the issues around participation. This study found that drug treatment service users were not aware of opportunities for participation, and some services did not believe that service users should have the chance to influence decisions. There was some realist evaluation work by Kazi & Spurling (2000) which looked at developing social inclusion models for drug users.

7.4.3 Data sources

Data was provided from Wirral drugs service (provided by CWP) for 2012/13 financial year and from criminal justice and other drug services provided by ARCH for 2011/12 and 2012/13 financial years. This was provided in the form of Excel spreadsheets which had a line listing where each line represented one client who had used the service. The analysis also used matched crime data from Merseyside police for criminal justice clients. Appendix 4 describes the drug and alcohol treatment datasets and the variables contained in these datasets.

The models were also populated with some data from the evidence where the data from the services was insufficient for estimating outcomes or probabilities for the economic modelling.

7.4.4 Methods

Three different service user groups were modelled; these were opiate and crack users, which represented mainly those who used CWP's services; cannabis and stimulant users, which represented mainly ARCH clients; and the Drugs Intervention Programme, which was mainly concerned with criminal justice outcomes as these were clients who had been identified through being arrested. These models were all created by the author.

Opiate and Crack User Model

A Markov model was constructed by the author using local data about opiate and crack users. The model was constructed using TreeAge 2013 software. Drug users were either in

one of four states; in treatment, not in treatment, in recovery, or death. A Markov model with 6 month cycles was used, where after every 6 months clients have a probability of moving from each state to another state. These probabilities were derived from local and national data. The model was run for a 60 year time period. The model assumed a fixed cohort over time, so over time their quality of life would diminish and risk of death increased. The quality of life value was highest for people in recovery, and was lower for people in treatment and lower still for people who were drug users who were not in treatment. Overall the model included an estimate of the QALYs (quality adjusted life years) gained for treatment and the costs of crime committed by drug users and an estimate of treatment costs.

Figure 61. Structure of opiate and crack user model.

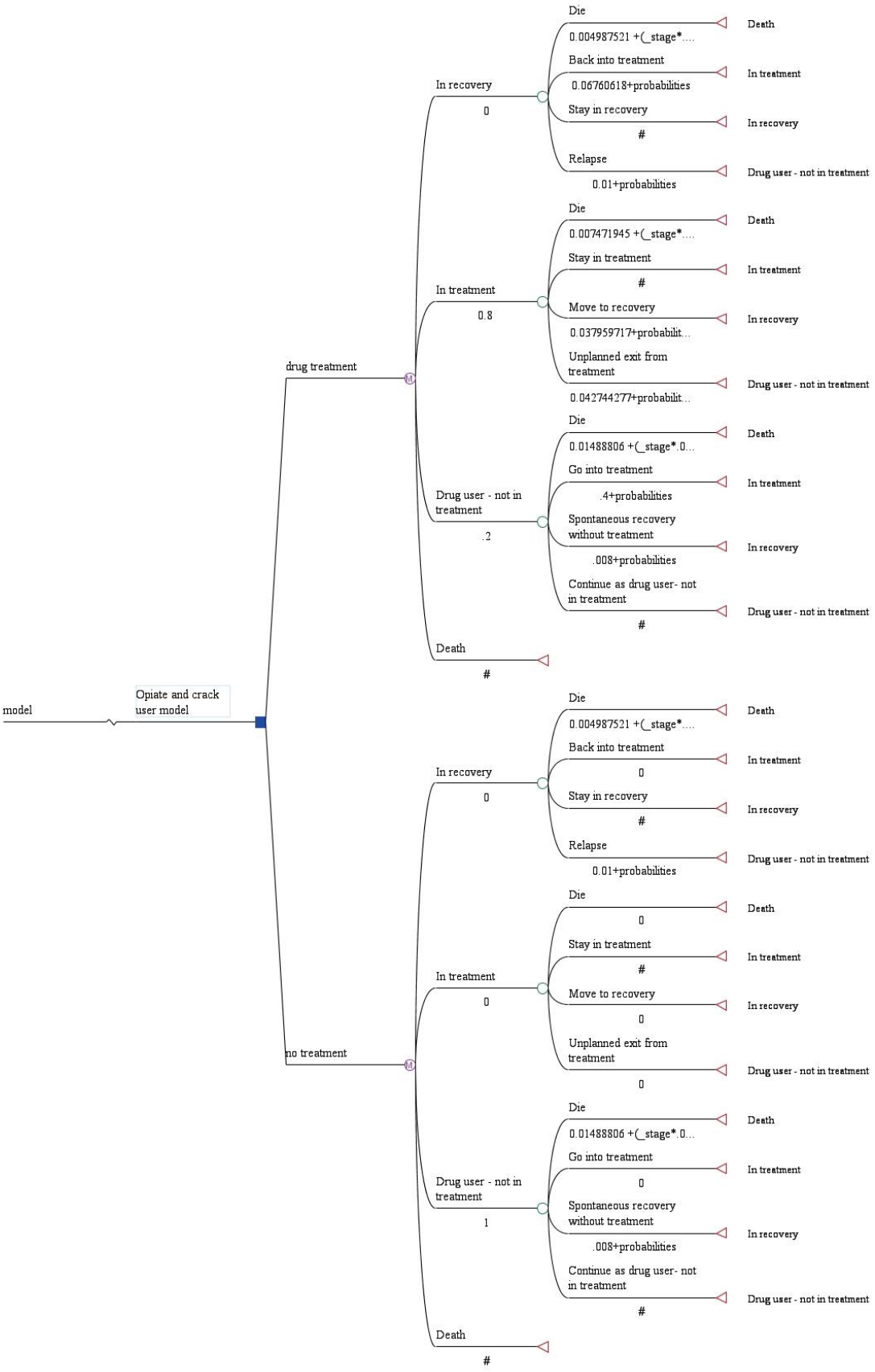


Table 47. List of parameters for opiate and crack user model.

Parameter	N	Standard Deviation for PSA	Distribution for PSA	Units	Source
Drug taking career (in absence of treatment)	20	NA		years	NTA VfM tool
Drug taking career (with treatment)	12	NA		years	NTA VfM tool
Average time in treatment	4	NA		years	NTA VfM tool
Drug taking career pre-treatment	8	NA		years	NTA VfM tool
Mortality rate post treatment, per year	0.01000	0.00100	normal	person per year	NTA VfM tool
Mortality rate in treatment	0.01500	0.00100	normal	person per year	assumption
Mortality rate outside of treatment	0.03000	0.00100	normal	person per year	assumption
Representation rate for drug treatment over 4 years	0.56000	Not inc	Not inc	person	NTA VfM tool
Representation rate for drug treatment over 10 years	0.69000	Not inc	Not inc	person	NTA VfM tool
Relapse from opiates cut off - time after which no more clients represent	10.00000	Not inc	Not inc	years	NTA VfM tool
Recovery rate - PDUs	0.29000	Not inc	Not inc	person	NTA VfM tool
Unsuccessful discharge rate	0.08737	Not inc	Not inc	person years	NTA VfM tool
Successful discharge rate	0.07740	Not inc	Not inc	person years	NTA VfM tool
Successful discharge (15% higher)	0.089008	Not inc	Not inc	person years	
Utility (in treatment)	0.742	0.14	beta	QoL scale	Dijkgraaf et al. (2005)
Utility (in recovery)	0.786	0.15	beta	QoL scale	Age average for 60 yr old man
Utility (drug user)	0.67	0.13	beta	QoL scale	QoL change data from TOPs
mortality increase per 6 months	0.001	Not inc	Not inc	persons/6 mths	assm (equates to 0.1% increase every six months)
increase in disutility per year	0.001419	Not inc	Not inc	QoL scale	Based on national EQ5D data
Recovery rate non PDUs	0.40000	Not inc	Not inc		NTA VfM tool
Crime costs (in treatment) (£)	39,967	4000	gamma	£ per year	DTORS
Crime costs (not in treatment) (£)	50,585	5050	gamma	£ per year	DTORS
Difference in crime costs (£)	10,145	30,678	gamma	£ per year	DTORS
Treatment costs	4,000	120	gamma	£ per year	Local finance data
Recovery costs (First year only)	700	35	gamma	£ per year	Local finance data

Stimulant and Cannabis User Model

A simple model was constructed to estimate the cost per QALY (Quality Adjusted Life Year) for people completing stimulant and cannabis treatment through ARCH. This used quality of life (utility) data for regular cannabis users in Wirral from the North West Mental Wellbeing Survey (2009) which found that cannabis users' quality of life score was 0.68 compared to 0.74 in the general population. This was matched to baseline TOPs quality of life scores which were very similar for cannabis and cocaine users. The average increase in quality of life scores between commencing and leaving treatment were also very similar for cannabis

and cocaine, at around 27%. A low estimate of QALY gains was produced with the assumption that any quality of life gained peaked at six months then went back to the baseline average quality of life. A high estimate assumed that any quality of life change was maintained over one year. Of course it is possible that the service may produce a quality of life change for many years, particularly in people who have had severe addiction and who have benefitted the most from treatment.

Table 48. Crime and employment outcomes, ARCH data for Wirral, 2011-2013.

Description	Value	Source
Baseline utility	0.68	Cannabis utility for Wirral from NWMWBS 2009
TOPs QoL Baseline (cannabis)	11.60	ARCH TOPs data
TOPs QoL Treatment Exit (cannabis)	14.75	ARCH TOPs data
TOPs QoL Baseline (cocaine)	11.51	ARCH TOPs data
TOPs QoL Treatment Exit (cocaine)	14.58	ARCH TOPs data
Utility on completion	0.864	Estimated follow up utility based on ratio of TOPs QoL scores

Drug Interventions Programme Model

An economic model was constructed for the Drugs Interventions Programme (DIP) which is a programme where people who are arrested for trigger offences are funnelled into drug treatment to reduce their criminal behaviour. This model was constructed by the author using MS Excel with Visual Basic for Applications (VBA). This model was a client level Monte Carlo simulation model which was run for 10,000 hypothetical clients where each time a random scenario was drawn from the data distributions. Overall averages were then calculated from the 10,000 random walks through the model. The model had a 12 month time horizon. Table 49 shows a list of parameters for the model. In the absence of data distributions for individual costs for the DIP and for drug treatment, an estimate of around 20% was used for the standard deviation for each, to introduce some rational variation into the model. In practice contact with the DIP usually results in a flat 6 months contact with drug services so costs may not vary by much.

Table 49. Parameters for Wirral DIP Cost Utility Model.

Parameter	Distribution	Mean	Standard deviation
Cost of crime - before	Skewed - bootstrapped from rawdata	£2,717	£111,766
Cost of crime - after	Skewed - bootstrapped from raw data	£11,626	£7,316
Cost of DIP	Normal – estimate based on local data	£924	£200
Cost of drug treatment	Normal - estimated based on local data	£429	£100
QALYs gained	Normal – from DTORS	0.05	0.201

The cost of crime unit costs were matched with the arrest reason for each time someone known to the DIP had been arrested in the 12 months before and 12 months after they have been identified as a drug user through the DIP. This data was matched with national crime database data by Merseyside Police. Some people will not be prosecuted or found guilty of these crimes, thus it may be that the crime was not committed and the total costs were not incurred (the costs of arrest have definitely been incurred though). It could be that some adjustment could be made to reduce the average cost to account for arrests that are not for genuine crimes. However it is estimated that only 27% of crimes are detected [but those detected are likely to be the more serious crimes], so any cost of crime estimate may also theoretically be inflated to take into account those crimes that are not detected (Home Office, 2012). Based on this it may be assumed that for each crime that is detected, individuals commit an average of three crimes that are not. Nationally, about 83% of people prosecuted for crimes are found guilty; however this varies by type of crime group. This present study is mostly concerned with the change in crime costs over time for people who have been identified through the DIP, so even if the estimated magnitude of costs are higher than they may be in reality, the ratio of costs for twelve months before and after being identified through the DIP should still be roughly correct.

By far the highest unit cost per crime is for homicide at £1.8million which is an outlier, so it may be that a small number of homicides will skew the average costs for clients before and after they have been through the DIP. The analysis of average costs has been carried out including and excluding homicides to see how this affects the results. Table 50 shows the arrest reason and the costs used.

Table 50. DIP Arrest reason and matched crime type and unit cost.

Arrest Reason	Crime type	Unit Cost
Other Theft	Theft – not vehicle	£781
[Blank] [Mainly 'warrant']	<other arrests>	£685
Drugs Possess Class A	<other arrests>	£685
Other Non-Crime	<other arrests>	£685
Drunk and Disorderly	<other arrests>	£685
Drugs Possess Class B	<other arrests>	£685
Burglary Dwelling	Burglary in a dwelling	£4,018
Breach of the Peace	<other arrests>	£685
Drugs Possess W/I Supply Class A	<other arrests>	£685
Burglary Other	Burglary not in a dwelling	£4,718
S.47 Assault	Other wounding	£10,024
Criminal Damage	Criminal damage	£1,078
Other Violence Against Person	Common assault	£1,792
Theft Of Vehicle	Theft of vehicle	£5,088
Other Crime	<other arrests>	£685
S.39 Assault	Common assault	£1,792
Robbery	Robbery – personal	£9,020
Theft From Vehicle	Theft from vehicle	£1,059
Disorder - Other	<other arrests>	£685
Traffic OPL	<other arrests>	£685
S.18 Wounding	Serious wounding	£26,360
Fraud and Forgery	<other arrests>	£685
Drugs Supply Class A	<other arrests>	£685
Disorder - Serious	<other arrests>	£685
Drugs Produce Class B	<other arrests>	£685
Going Equipped for Stealing	<other arrests>	£685
Drugs Possess W/I Supply Class B	<other arrests>	£685
Handling Stolen Goods	<other arrests>	£685
Aggravated Vehicle Taking	Theft of vehicle	£5,088
S.20 Wounding	Other wounding	£10,023
Traffic General	<other arrests>	£685
Aggravated Burglary Dwelling	Burglary in a dwelling	£4,018
Sexual Offence	Sexual offences	£37,831
Burglary in a dwelling	Burglary in a dwelling	£4,018
Drugs Other	<other arrests>	£685
Violence against the person	Common assault	£1,792
Drugs Supply Class B	<other arrests>	£685
Homicide	Homicide	£1,816,918
All others	<other arrests>	£685

Average QALYs gained from the DTORS study (2009) were used. The QALYs were calculated using the Short Form 12 (SF-12) survey instrument. As will be shown, the

average QALYs gained per client in the DTORS was small, with a wide spread of data points which included many clients who were estimated to have net QALY losses in their time in drug treatment. The DTORS cost effectiveness study was essentially a before and after study as well, where baseline utility scores were extrapolated. To calculate the net present value (NPV) of the intervention, the QALYs were valued at a base scenario of £20,000 per QALY gained which is the quoted threshold for willingness to pay for a QALY used by NICE for assessing public health interventions. The difference in costs and the monetary valuation of benefits were used to estimate the cost-benefit ratio.

Both the costs of crime and the QALY differences were estimated over a 12 month time horizon only so no discounting was used for the costs or outcomes. Analysis of differences between crime rates before and after were carried out by subgroups, these were gender; those testing positive for cocaine only, opiates only and both cocaine and opiates; and by test outcome groups (assessed, care planned, no further DIP contact). Measures of quality of life and psychological and physical health from the Treatment Outcomes Profiles (TOPs) were also analysed.

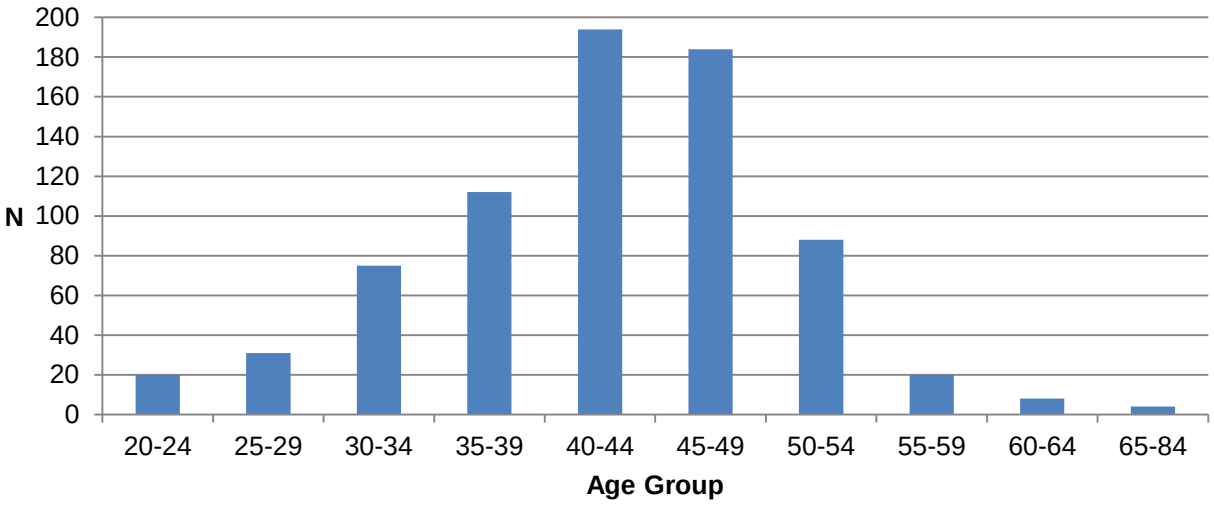
7.4.5 Results

Results – CWP Drug Treatment

Because there is little actual population data on problematic drug use across different groups, it is difficult to carry out an equity impact assessment. The best that can be said is that the services seem to be open to many different groups and have a broad mixture of clients. There would be debate about what represents 'need' in a population, with some people believing that a level of recreational drug use in young people is not aberrant behaviour, although it can be dangerous in some cases; most young people naturally grow out of drug use by the time they reach their 30s without any intervention (Home Office, 2013).

We were provided with data for primary drug users in treatment during 2012/13. This includes clients who were discharged after 1st April 2012, and clients who were still in treatment as of 28th October 2013. 51% of clients were aged between 40 and 50. There were no clients aged less than 20 years. 71% of clients were men, 29% women. Ethnicity was recorded for 93% of clients; 2% of clients were non- White British.

Figure 62. CWP drug treatment clients by age. Wirral, 2012/13 financial year.



The biggest source of referral into services was self-referral, which accounted for 58% of referrals. This may include people who have been signposted from other services or agencies.

The data had only partial postcodes, but using a rough matching algorithm (described in chapter 1.2 A Pen Portrait of Wirral - A Microcosm of the UK?) , around 64% of clients lived in the areas of Wirral that fall into the most deprived quintile (20%) nationally in terms of Index of Multiple Deprivation (IMD 2010) scores. This area accounts for around 32% of the Wirral population, so drug treatment clients are about twice as likely to be from the most deprived areas. The primary drugs of abuse for CWP clients were nearly all cocaine or opiate drugs. In terms of primary drug, the most frequently used was heroin. The average age of first drug use was 22 years. 51% of users had a second drug recorded which were mainly crack cocaine (34%), methadone (22%), heroin (12%) and benzodiazepine drugs like diazepam [Valium] (12%). A small percentage (5%) of clients were recorded as injecting, although route of drug administration was only recorded for around 50% of clients.

People who primarily use other drugs like stimulants or cannabis are more often seen in ARCH's services, although CWP provide support for some people who use prescription drugs. One member of staff interviewed from CWP talked about a case of an older woman who had become dependent on morphine (oramorph) after going through intense radiotherapy for cancer, where the GP did not know what to do to get her off the drug. In this case the drug service's expertise could be used to talk to her, deal with her fears and psychosocial problems and taper her dose of oramorph until she no longer needed it. In this case the service stated that the GP may have struggled to find enough time to deal with all of these issues. Staff from CWP said that they would like to be able to provide more

prescription drug support and that GPs would value help with people who were dependent on benzodiazepines in particular.

Table 51. CWP clients by primary drug and average age first used. Wirral, 2012/13 financial year.

Primary drug	Number	% of total	Average age first used
Heroin illicit	450	61.1%	22
Methadone Mixture	101	13.7%	22
NULL	93	12.6%	
Dihydrocodeine	21	2.9%	30
Cocaine Freebase (crack)	12	1.6%	21
Buprenorphine	10	1.4%	26
Codeine unspecified	9	1.2%	27
Tramadol Hydrochloride	8	1.1%	32
Codeine Tablets	5	0.7%	20
Diazepam	4	0.5%	19
Other	23	1.9%	20
Total	**736**	**100.0%**	**22**

According to the data, 75% of clients had a psychosocial intervention, and 89% of clients had some sort of prescribing. Shared care prescribing arrangements were in place for 37% of clients; rather than attending the drug service these clients were able to be seen in their own GP practice and to pick up their prescriptions from their local pharmacist which makes life easier for them, especially as some of them work or take care of families so do not want to have to go to St Catherine's, "the hospital on the hill" where the drugs service is based, all of the time. GPs were paid for having their clients under Shared Care and the Shared Care drug workers are a central point of contact for any drug problems seen in primary care. 11% of clients had no intervention recorded. This could possibly be because they did not agree to their data being shared with the NDTMS. The recorded modalities specified by the NTA are very broad so do not tell us much about the specific elements of drug treatment.

The primary drugs of abuse for CWP clients were nearly all cocaine or opiate drugs. In terms of primary drug, the most used was heroin. The average age of first drug use was 22 years. 51% of users had a second drug recorded which were mainly crack cocaine (34%), methadone (22%), heroin (12%) and benzodiazepine drugs like diazepam [Valium] (12%). A small percentage of clients (5%) were recorded as injecting, although route of drug administration was only recorded for around 50% of clients.

Table 52. CWP clients by treatment modality. Wirral, 2012/13 financial year.

Treatment modality	% of total clients
Shared care prescribing	37%
CWP prescribing	74%
Psychosocial intervention	75%
Recovery support	13%
Total with any modality recorded	89%

30% of clients had a discharge outcome recorded (the rest were presumably still in treatment at the end of the time period). Of those with discharge outcomes, 46% were treatment completed-drug free, and 32% were transferred. 'Transfer not in custody' means that either;

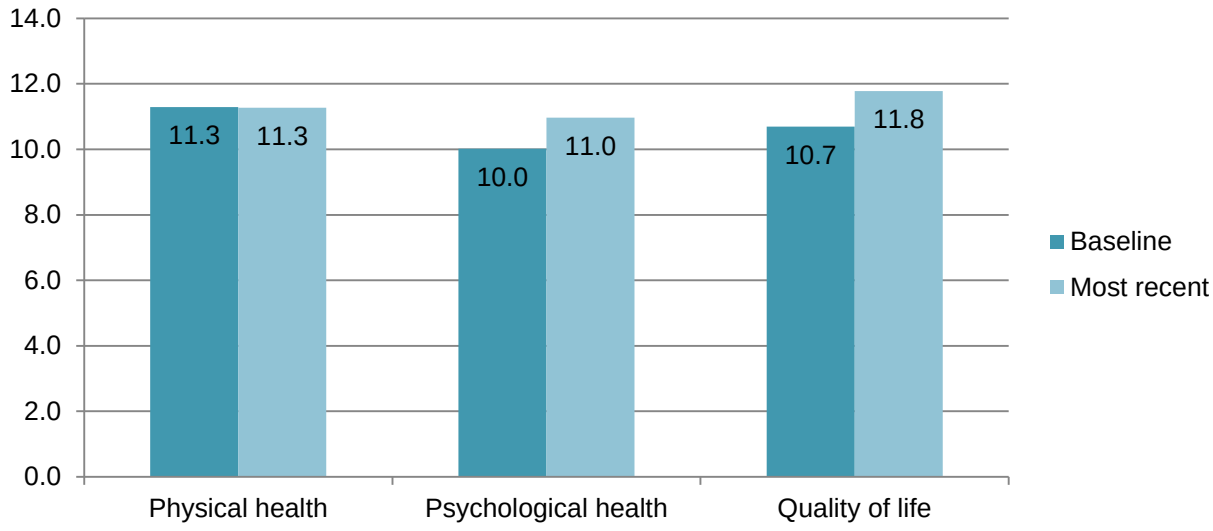
1. Client was transferred to another treatment provider for ongoing community treatment.
2. Client was transferred to a residential detoxification unit.
3. The client transferred to a residential rehabilitation unit on completing a community detoxification.

Table 53. CWP clients by discharge outcome, where recorded. Wirral, 2012/13 financial year.

Discharge Outcome	% of total with outcomes recorded
Treatment completed - drug-free	46%
Transferred - not in custody	20%
Incomplete - dropped out	13%
Transferred - in custody	12%
Incomplete - Client Died	7%
Treatment completed - occasional user (not heroin or crack)	1%
Incomplete - treatment commencement declined by client	1%

The number of opiate and crack users moving into recovery had increased overall in the last five years although the number of people completing drug free had stalled over the last three years. The service said that they were having shared learning sessions where key workers who were particularly successful in getting their clients into recovery could share their ways of working. They were also running focus groups for clients who had been on methadone for over six years to see what they needed to move into recovery. Blind reductions in methadone were one method that could be used with client consent, or moving them onto buprenorphine (Subutex) was another method of moving clients towards being drug free. Clients showed an improvement in self-reported psychological health and quality of life over time but not in physical health. They did not show deterioration in physical health.

Figure 63. CWP clients' average self-reported physical health, psychological health, and quality of life from TOPs. Scores out of 20. Wirral, based on a cross section of clients from 2012/13 financial year.



For clients who were discharged in the time period, the average time in treatment was 13.8 months, and clients were seen on average twice a month, for 30 minutes each time. The clients with no primary drug recorded were those who were most likely to have been in treatment for over 5 years on average. There may be issues with how the data is updated as the NDTMS database has not been in operation for all the time that long term clients have been in the service. Some clients and other services reported that CWP had a lot of clients on long term methadone who were not seen very often and were followed up over the phone rather than face to face. Some people who had been through drug treatment said they had not been told about how they could go into recovery. The minimum recommended review schedule for people on methadone is to see their key worker face to face every three months and a doctor every six months. CWP said that all clients had a plan which included how often they wanted to be followed up, and whether they wanted to come off methadone. The

service reported that because some of their clients had very intensive needs, key workers may have to put a lot of resource into one person so if other clients did not want to be seen or were stable then they could not always prioritise seeing them. They gave an example of a man who had been in treatment for 20 years; the key worker had seen him regularly and he was on a stable methadone prescription, but the key worker had never been let in to see him at home where he lived alone with his dog. One time they went with an ex-service user who knew the man, and were able to access his home. They found that the accommodation was in an appalling state, with pigeons living in the upstairs rooms and the downstairs rooms being full of dog mess and rubbish. This client could not look after himself, but they could not get social services to define him as a vulnerable adult, so the CWP key worker took responsibility for finding him a place in sheltered accommodation, finding a place nearby for the client's dog who he did not want to be apart from, and organised a collection in the office to buy this client basic household items. This took the key worker the best part of a week to do, and would have ultimately given the client a significant improvement in his quality of life. The service also reported that dealing with clients with personality disorders can take up a lot of time, as they are often at the point of being kicked out of housing, rejected by their families, and where mainstream health services do not want to deal with them.

Table 54. CWP discharged clients, average time in treatment and number of times seen. Wirral, 2012/13 financial year.

Primary drug	N of clients completing treatment	Average of Months in treatment	Average N of times seen	Average number of hours seen in treatment	Average N appts /month
Heroin illicit	145	11.4	23.2	9.7	2.0
Methadone Mixture	26	8.3	20.0	8.9	2.4
Not recorded	16	62.3	86.4	35.0	1.4
Dihydrocodeine	7	3.7	15.4	9.8	4.2
Codeine unspecified	6	5.9	20.0	11.3	3.4
All clients	221	13.8	26.5	11.3	1.9

Cost Effectiveness Results – Crack & Opiate User Model

The majority of clients in CWP services were crack and/or opiate users. Results were modelled for 713 clients, of whom 221 completed treatment.

The average life expectancy with treatment was 3 years greater (or 2.61 QALYs) than without treatment and crime costs were around £150,000 lower over an individual's lifetime. So the treatment scenario dominates the no treatment scenario; it is more effective and less costly. The average life expectancy was quite low overall at around 15.5 years; this is because the model has taken into account the age of the OCU population in Wirral who are generally in their 40s or 50s and have a high risk of health problems related to years of drug, alcohol and tobacco use.

Table 55. Results from cost effectiveness model for opiate and crack users in Wirral, based on a lifetime model including treatment and criminal justice costs.

	Treatment	No treatment
Total cost (CI)	£10,929,649 (7,628,388-£14,230,910)	£95,177,051 (£69,015,994-£121,338,108)
Total QALYs (CI)	738 (730-744)	733 (726-739)
Cost per patient (CI)	£15,328 (£10,699-£19,959)	£133,488 (£96,797-£170,178)
Cost per completer (CI)	£49,453 (£34,517 - £64,393)	N/A
Cost per QALY (CI)	£14,807 (£10,251 - £19,483)	£129,768 (£93,385 - £167,105)
ICER (Incremental Cost Effectiveness Ratio)	Dominant	Dominated

Probabilistic Sensitivity Analysis – Crack & Opiate User Model

A probabilistic sensitivity analysis (PSA) was carried out to see how sensitive the model results were to parameter estimates that are subject to a degree of uncertainty. The results of the probabilistic sensitivity analysis are shown in Figure 64. The iterations are mainly in a region that would be considered to be cost effective at a willingness to pay threshold of £20,000 per QALY (to the right of the dashed line). In the cost effectiveness acceptability curve, shown in

Figure 65, the intervention has a 73% probability of being cost effective at a willingness to pay of £20,000 per QALY and a 78% chance of being cost effective at a willingness to pay of £30,000 per QALY. A set of one way sensitivity analyses showed that the net present value of interventions was most sensitive to the costs of treatment and the cost of crime associated with drug use (Figure 66).

Figure 64. Opiate and crack user model; iterations of incremental cost effectiveness, with ellipse showing 95% prediction intervals.

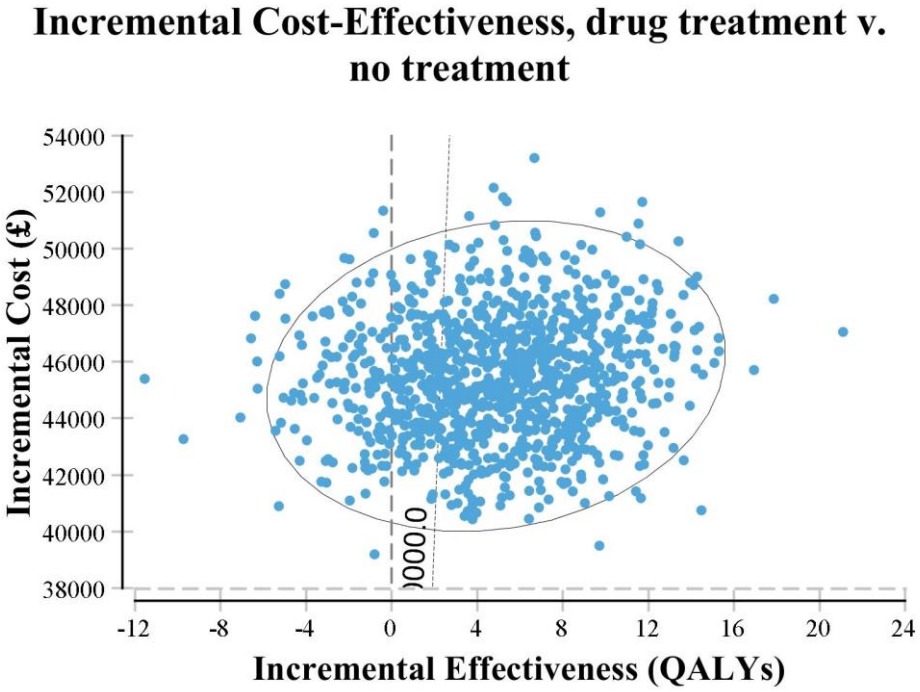


Figure 65. Cost effectiveness acceptability curve, opiate and crack user model, showing probability of drug treatment being cost effective vs probability not cost effective at different values of willingness to pay for one QALY.

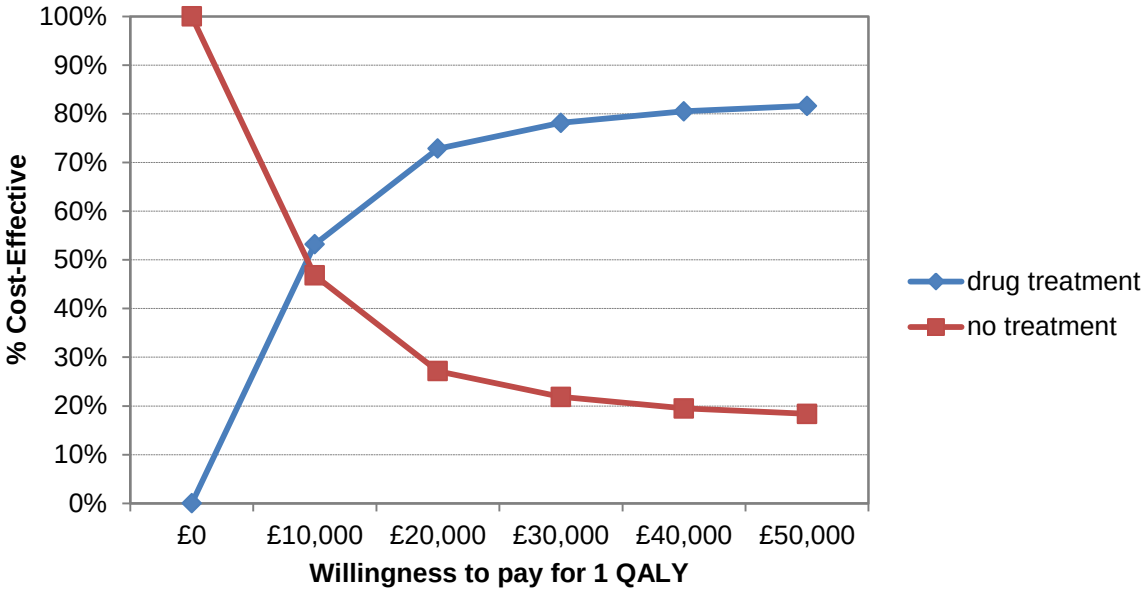
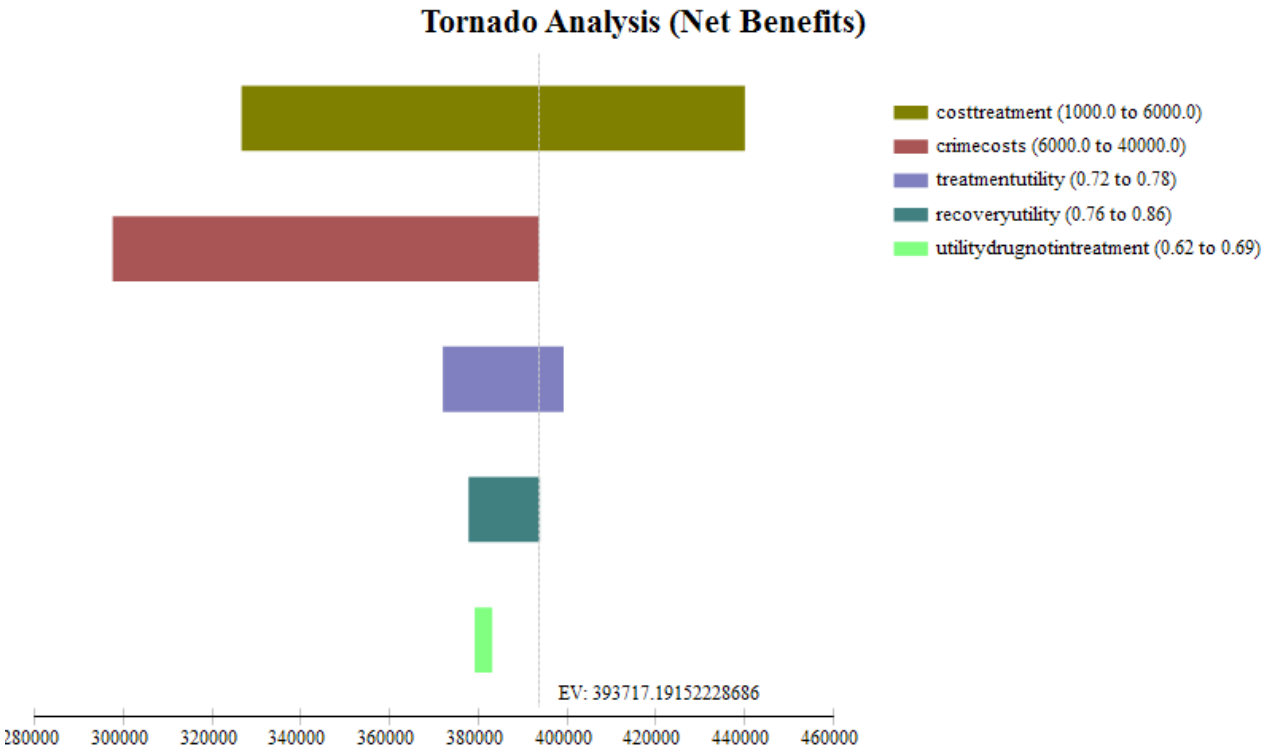


Figure 66. Opiate and crack user model. Tornado diagram showing one way sensitivity analyses. EV= expected value of net mean benefits.



Results – ARCH Drug Treatment Services

ARCH typically saw clients with less severe drug dependence issues or provided aftercare to people in recovery. Clients were 73% male, 27% female. As with the other drug treatment service, it is difficult to carry out much equity impact assessment as it is difficult to determine the level of need in the population. Most local needs assessment around drugs is based on numbers of people in treatment rather than working from the ground up, although this may be very difficult to do. With aftercare services, the data indicated that a majority of people who exited the main drug treatment services provided by CWP did go onto something else, whether it was formal aftercare or whether it was narcotics anonymous which is provided voluntarily.

Excluding those who had alcohol as their main drug, clients were 79% male, 21% female. There is evidence that female problematic drug users have greater needs than males so tailoring interventions is important; for example one in three women in prison have suffered sexual abuse compared with just under one in 10 men (Corston, 2007). Services said that women who had been heroin addicts talked about heroin culture as being “a man’s world” and that when they went into recovery they learned to be a woman again. Ethnicity was recorded for all clients; 98% were White, while 1.4% were Asian/Asian British, Black/Black British or Mixed, while 0.5% were not stated. Using a rough matching algorithm (as the postcodes only included the first 5 characters), around 61% of clients were from the most deprived parts of Wirral, which fall into the most deprived quintile nationally in terms of Index of Multiple Deprivation (IMD 2010) scores. These areas make up 32% of the Wirral population, so the most deprived areas have an odds ratio for being in drug treatment of 3.3 compared to the whole of Wirral. In terms of sexuality, 1.7% of clients were recorded as homosexual (gay or lesbian) while 1.0% were bisexual, 87.5% heterosexual and 9.8% sexuality not given or not recorded.

Overall there were 1,972 unique clients for Wirral in this time period of which 639 had alcohol as their primary drug and 1,333 had another drug. There were around 150 clients who were in the service for more than one different primary drug in the two years, mainly combinations of alcohol, heroin and methadone. Most drug groups had many more males in treatment than females. Cannabis had the highest ratio of males to females, while crack and amphetamine were the closest to having equivalent numbers of males and females in treatment. Most people (61%) lived in the most deprived areas, with crack users being particularly likely to be in the most deprived areas (74% estimated to live in the most deprived quintile). Compared with the CWP treatment services which were almost all primary opiate and cocaine users (although many steroid users use the needle and syringe

exchanges), there is a lot more diversity in terms of the drugs used by ARCH's clients. This is because they provide a cannabis and stimulant service and because they have clients who are identified through the criminal justice system.

Table 56. ARCH clients by source of referral. Wirral, 2011/12 financial year.

First Primary Drug Group	N clients	Females	Males	Ratio M:F	% of total clients	Estimated % living in most deprived quintile
Alcohol	639	238	401	1.68	32%	59%
Heroin	376	79	297	3.76	19%	66%
Cannabis	363	47	316	6.72	18%	64%
Cocaine (excluding Crack)	319	57	262	4.60	16%	54%
Amphetamines (excluding Ecstasy)	78	34	44	1.29	4%	63%
Crack	68	32	36	1.13	3%	74%
Methadone	56	15	41	2.73	3%	63%
Prescription Drugs	34	11	23	2.09	2%	56%
Other Opiates	12	5	7	nts	1%	42%
Benzodiazepines	10	<5	6	nts	1%	50%
Other Drugs	8	<5	5	nts	0%	50%
Ecstasy	<5	<5	<5	nts	0%	67%
Hallucinogens	<5	<5	<5	nts	0%	67%
Misuse free	<5	<5	<5	nts	0%	50%
Other Opiates	<5	<5	<5	nts	0%	100%
Grand Total	1972	525	1447	2.76	100%	61%

nts= numbers too small to calculate a meaningful ratio.

In terms of additional drugs, 59% of clients had a second drug recorded (43% excluding alcohol as drug 2) and 28% of clients had a third drug recorded. Heroin and crack users were most likely to have a second and third drug recorded.

Table 57. Number of clients by first primary drug group with second and third drug recorded, ARCH data for Wirral, 2011-2013.

Drug 1	Number of clients	% with a drug 2 (including alcohol)	% with a drug 2 (excl. alcohol)	% with a drug 3 (including alcohol)
Alcohol	639	32%	32%	12%
Heroin	376	85%	76%	54%
Cannabis	363	47%	20%	13%
Powder Cocaine	319	79%	39%	31%
Amphetamines	78	68%	47%	28%
Crack Cocaine	68	85%	69%	51%
Methadone	56	79%	55%	39%
Prescription Drugs	34	79%	59%	50%
Other Opiates	12	67%	58%	50%
Benzodiazepines	10	90%	80%	70%
Total	1972	59%	43%	28%

Excludes Other Drugs (continued), Ecstasy, Hallucinogens, Misuse free and Other Opiates (continued) which have small numbers.

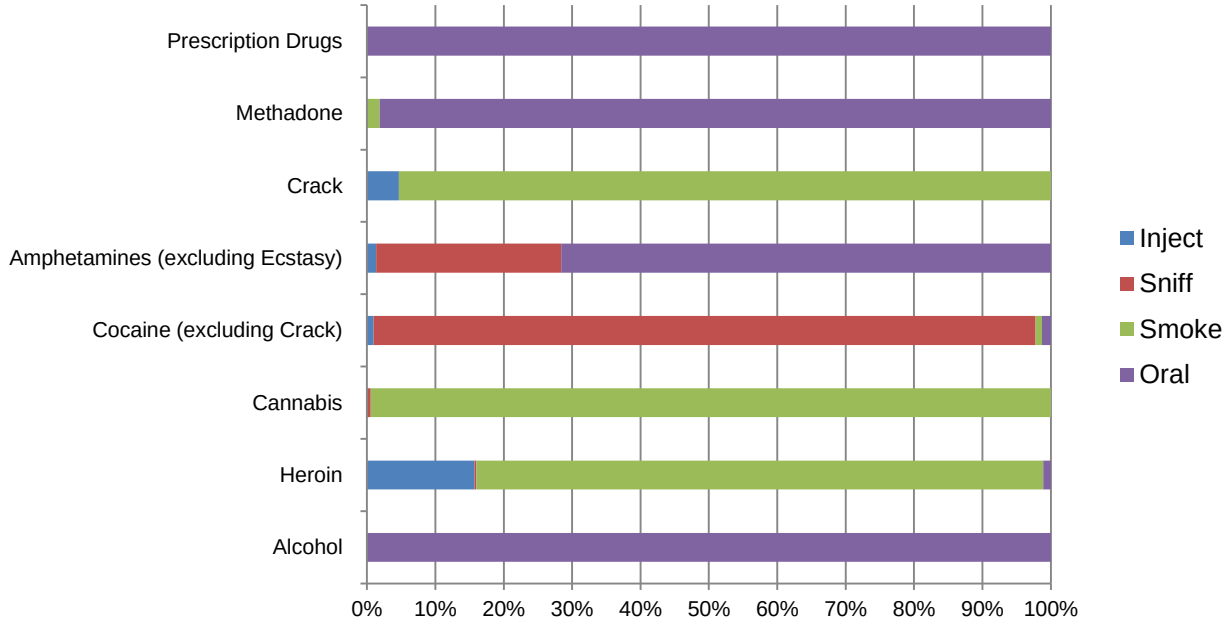
In terms of combinations of first and second drug groups, clients were very diverse with in excess of 150 combinations. Many clients reported combinations of alcohol and other drugs. Alcohol makes people less inhibited and more likely to seek drugs (Feil et al., 2010), which reinforces the need to treat any alcohol problems at the same time as other drug problems. Across the two years, 5% of clients were recorded as current injectors and 30% were previous injectors, excluding primary alcohol clients.

Table 58. Most common combinations of first and second drug, ARCH data for Wirral, 2011-2013.

Drug 1 & 2 combination	N of clients	% of clients
Alcohol only	436	22%
Cannabis only	193	10%
Heroin Crack	156	8%
Cocaine (excluding Crack) Alcohol	126	6%
Cannabis Alcohol	99	5%
Cocaine (excluding Crack) Cannabis	83	4%
Cocaine (excluding Crack) only	67	3%
Heroin only	56	3%
Heroin Methadone	52	3%
Alcohol Cannabis	46	2%
Heroin Alcohol	36	2%
Cannabis Cocaine (excluding Crack)	35	2%
Alcohol Anti-depressants	32	2%
Alcohol Cocaine (excluding Crack)	30	2%
Other combination	107	27%

The majority of heroin users reported smoking rather than injecting heroin which is a success of clients in treatment being encouraged to use heroin in a less risky way (Figure 67). Services also encourage crack smokers to smoke crack in a safe way, i.e. not through plastic or copper pipes which give off toxic fumes.

Figure 67. Primary drugs by route of administration, ARCH clients, 2011/12 – 2012/13.



There were 1,972 unique clients in treatment over the 2 years, with the most common treatment modality being advice and information. There were 1,564 psychosocial interventions delivered. 487 clients had some sort of prescribing or pharmacological intervention.

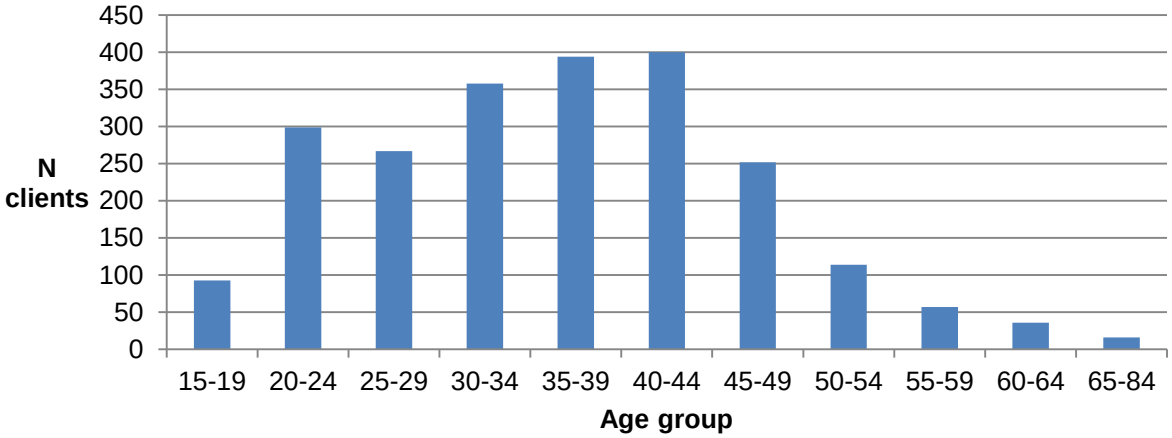
Table 59. Number of clients by treatment modality, ARCH data for Wirral, 2011-2013.

Treatment modality	Number
Alcohol Inpatient Treatment	347
Alcohol Structured Day Programme	280
Inpatient Treatment Detoxification	129
Inpatient Treatment Stabilisation	1
Specialist Prescribing	202
Advice and information	1761
Alcohol – Other Structured Treatment	8
Alcohol - Structured psychosocial intervention	72
Other formal psychosocial therapy	236
Other structured intervention	13
Pharmacological Intervention	285
Psychosocial Intervention	579
Psychosocial Intervention Mental Disorder	1
Recovery Support	410
Structured day programme	164
Structured psychosocial intervention	676
Total interventions delivered	5,164
N clients with any modality	1,972

In terms of housing status, 4% of clients had a recorded housing problem and 2.7% of clients had no fixed abode. 41% of clients with housing problems were primarily heroin users while the majority of the rest were primarily cannabis and cocaine users.

Clients were fairly evenly spread across age groups from 20-49 with a few clients being older or younger than this. The average age of clients was 36 years including alcohol clients, or 32.8 years excluding alcohol clients. The average age for men and women was similar. Staff from ARCH said that younger clients often felt let down by services and the police and sometimes the most important thing was 'planting the seed' with them, and making it easy for them to drop in when they were ready to make a change. ARCH has a partnership intervention with Forum Housing where they see mainly young people who are identified by a link worker. These clients may be identified through their behaviour such as having noisy all night parties. ARCH sees these clients in an informal non-drug setting, at Forum offices, in their home or in a café to break down the barriers so that the clients feel comfortable speaking honestly about their behaviour.

Figure 68. ARCH clients, Age at start of year in treatment, 2011/12 - 2012/13.



In terms of individual drug groups, alcohol, crack, heroin, methadone and prescription drug clients were around 8-10 years older than cannabis, cocaine and amphetamine clients. In terms of average age of first use, there was a pattern of cannabis being very young at 14 years, ecstasy and alcohol at 17, then cocaine and amphetamines at 20, heroin at 22, methadone at 25 and crack at 27. A member of staff from ARCH talked about clients who had used cannabis since their adolescence who were “locked in puberty and still acting like 13 year olds”. The people who deliver the services reported that cannabis use was increasing as a problem in service users, who were coming through open access and referrals. There had been an increase in service users who had been arrested for cultivating cannabis for their own use, which they had chosen to do as it was more economic than buying off other people. The service reported some success stories for people who were low level cannabis users who did not realise the harms of cannabis. The service runs a monthly cannabis awareness session through the police which is provided as an alternative for receiving a caution for people who have been caught with small amounts of cannabis in their possession.

Table 60. ARCH clients by average age started using primary drug and average age at start of year in treatment.

Primary drug group	Number of clients	Average age first used	Average of age at start of year in treatment
Alcohol	639	17	42
Heroin	376	22	38
Cannabis	363	14	27
Cocaine (excluding	319	20	28
Amphetamines	78	20	33
Crack	68	27	39
Methadone	56	25	40
Prescription Drugs	34	28	39
Other Opiates	12	30	35
Benzodiazepines	10	26	35
Other Drugs (cont.)	8	33	39
Ecstasy	<5	17	27
Hallucinogens	<5	32	34
Misuse free	<5	n/a	43
Other Opiates (cont.)	<5	46	48
Grand Total	1972	19	36

In terms of source of referral, the biggest sources were self-referral, followed by arrest referral (i.e. through the Drug Intervention Programme), then hospital (mainly alcohol referrals to Birchwood residential detoxification), CARAT [Counselling, Assessment, Referral Advice, Throughcare]/Prison, and drug services.

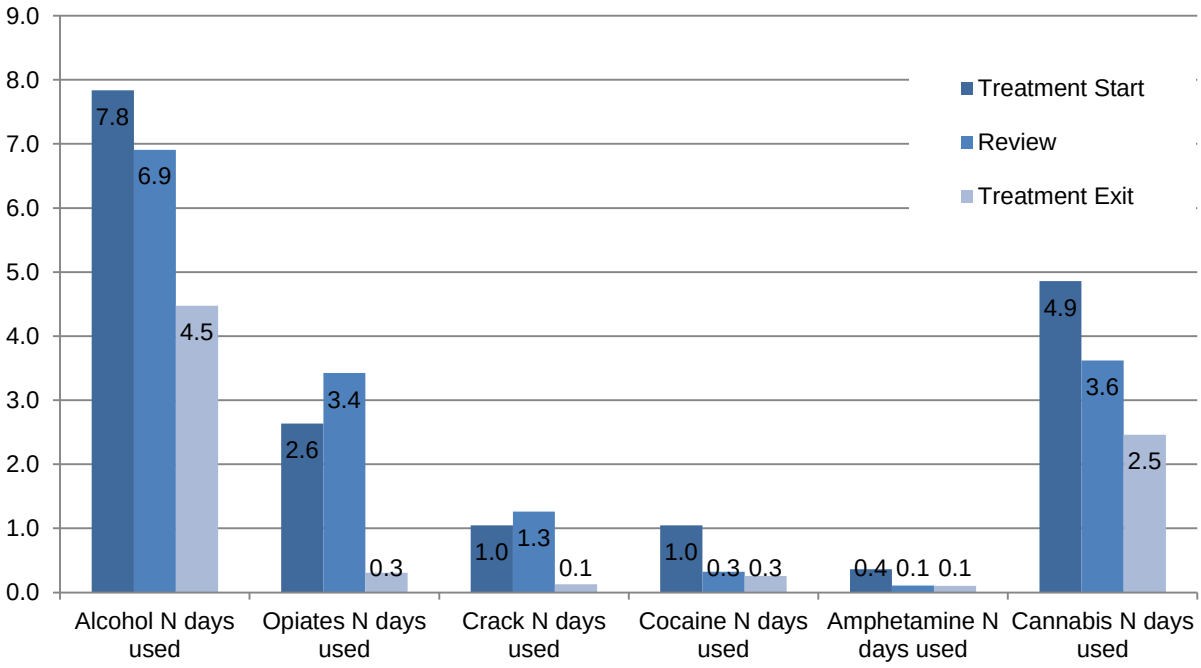
Table 61. ARCH clients by source of referral.

	Main drug		Total	% of Total
Referral Source	Alco	Other		
Self	81	529	61	31%
Arrest Referral	6	250	25	13%
Hospital	219	11	23	12%
Other	113	86	19	10%
Counselling, Assessment, Referral, Advice and Throughcare (CARAT) /Prison	26	117	143	7%
General Practitioner	97	30	12	6%
Drug service non-statutory	39	84	12	6%
Drug service statutory	20	90	11	6%
Probation	2	95	97	5%
Social Services	18	22	40	2%
Community Alcohol Team	9		9	<1%
Outreach	1	6	7	<1%
Criminal Justice Other	<5	<5	5	<1%
Accident & Emergency	<5	<5	<5	<1%
Drug Rehabilitation Requirement	<5	<5	<5	<1%
Job Centre Plus	<5	<5	<5	<1%
Drugs Interventions Programme	<5	<5	<5	<1%
Employment Service	<5	<5	<5	<1%
Connexions	<5	<5	<5	<1%
Syringe Exchange	<5	<5	<5	<1%
Psychological Services	<5	<5	<5	<1%
Total	639	1333	19	100%

These outcomes are based on a cross section of clients across the two years. During this time a number of clients will start treatment, be followed up and will leave treatment. Most of the outcomes are based on TOPs (Treatment Outcomes Profiles) which are subject to bias as individuals may be keen to please their case worker, or may be afraid to say that they are continuing to use drugs. However some clients like those who are prescribed opiate substitution therapy or those on probation are also saliva tested for drugs every two weeks which acts as a check against their self-reported outcomes.

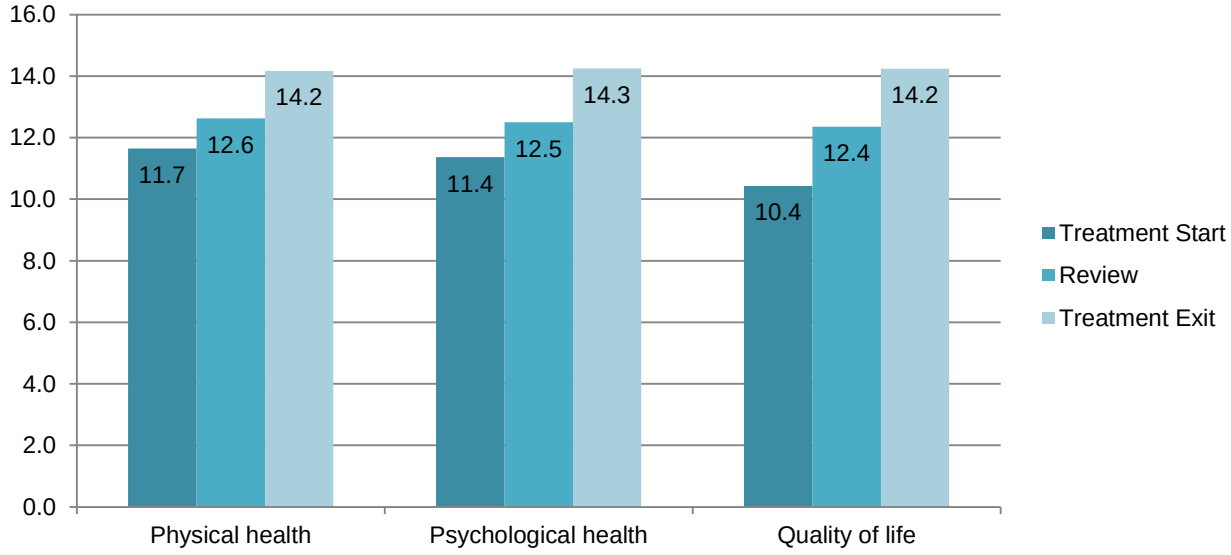
Across all clients, average numbers of days using drugs in the last 4 weeks fell between treatment start, review and treatment exit (Figure 69). Use of cocaine, crack and amphetamine was particularly low at treatment exit. There were still 21 clients using opiates at treatment exit, but this would include prescribed methadone and buprenorphine. Alcohol and cannabis use was still prevalent at treatment exit.

Figure 69. Average numbers of days using drugs in the past 28 days, based on TOPs for all clients, ARCH, 2011/12 to 2012/13.



Physical health was rated as 22% better for people at treatment exit than at treatment start, while psychological health was rated as 25% better and quality of life as 36% better. All of these differences were statistically significant ($p<0.05$).

Figure 70. Average self-reported physical health, psychological health and quality of life, based on TOPs for all clients, ARCH, 2011/12 to 2012/13. Scores out of 20.



There were improvements in the proportion of clients who reported shoplifting and other crimes, and improvements in the number of clients who were in paid work or education at treatment exit. As stated previously, these self-reported measures may not always be reliable.

Table 62. Crime and employment outcomes, ARCH data for Wirral, 2011-2013.

TOPs Stage	% reporting shoplifting	% reporting selling drugs	% reporting other theft	% reporting assault	% with paid work	% in education
Treatment Start	4.1%	1.07%	0.71%	2.0%	12.8%	1.1%
Review	3.3%	0.72%	0.32%	1.0%	10.1%	2.0%
Treatment Exit	0.3%	0.17%	0.00%	0.5%	17.2%	3.5%

Economic Model Results – Cannabis & Stimulant Users

A simple economic model was produced for cannabis and stimulant users based on evidence and data from ARCH. Overall the mid-range estimate of cost per QALY gained was £4,934 which would compare favourably with NICE's threshold for willingness to pay for public health interventions of anything less than £20,000 per QALY gained (Rawlins et al., 2010). This model considered the value of the individual quality of life gains alone; so once crime, employment, relationships, and reduction in risk of health problems like psychosis, lung disease or heart attack is taken into account, these interventions could be cost saving to the public purse. This is a very simple model and carrying out a PSA may change the results but even with this simple model the interventions are very likely to be cost effective based on the quality of life improvements alone.

Table 63. Results of cannabis and stimulant user model

Parameter	Value	Notes
Estimated QALYs gained by completers (low estimate)	0.046	QALYs based on 6 months linear change only
Estimated QALYs gained by completers (high estimate)	0.184	QALYs based on 1 year change
Cost of intervention per completer	£364	Cost of psychosocial only treatment SCNR for Wirral
Cost per QALY gained (low estimate)	£1,974	
Cost per QALY gained (mid estimate)	£4,934	
Cost per QALY gained (high estimate)	£7,895	

Results – Drug Interventions Programme (DIP)

The main types of offences committed by the 266 people in contact with the DIP were acquisitive and drugs offences. The analysis by LJMU (Cuddy et al., 2015) found that there was a significant reduction in offending in the 12 months post-test compared with the 12 months pre-test ($F [1,263] = 58.035$, $p < 0.001$). There was a reduction across people who had tested positive for cocaine, opiates and both drugs (see Table 66). The overall volume of offending of Wirral residents in the sample reduced by 52% post DIP positive drug test. National research from 2007 suggested a 26% reduction in crime post-DIP (Skodpo et al., 2007) so if national figures are still similar this means that the DIP in Wirral is associated with a greater reduction in crime than the national average. Those individuals who were care planned by the DIP team following their arrest showed the most substantial reduction in number of offences pre and post-test. However, there were no statistically significant differences between the three groups in the change in the numbers of offences pre to post test ($F [2,263] = 1.931$, ns) (Cuddy et al., 2015). This lack of statistical significance may be driven in part by the smaller sample size once the sample was split (see Table 64). Regression analysis was carried out to investigate predictors of future offending among Wirral residents who tested positive during the time period examined. The prolificacy of clients' offending pre-test was a significant predictor of future offending ($p < 0.001$) but no other factors examined provided statistically significant predictors for this group. Individuals in the highest group for offending and with the most serious crimes showed the most substantial reduction in the seriousness of their offending.

Table 64. Wirral Residents Testing Positive in the DIP – Number of Trigger Offences. Data for Wirral, April - September 2013.

Groups Compared	**Mean Number of Offences**		**Difference**	**Significance**
	12 months pre test	12 months post test		
Overall (n=266)	2.8759	1.3835	1.4924	$p < 0.001$
Assessed (n=68)	2.2647	1.3088	0.9559	Ns
Care Planned (n=141)	2.6809	0.9858	1.6951	
No further DIP Contact (n=57)	4.0877	2.4561	1.6316	

Source: Table from Cuddy et al. (2015)

The crime costing data included 264 out of 266 clients. The crime costs were 77% lower in the 12 months post DIP, or 43% lower excluding the one case of homicide (Table 65). This is

similar to the 52% reduction in the number of crimes. The data for costs of crime was not normally distributed so a non-parametric Wilcoxon signed ranks test rather than paired sample t test was used. The difference in costs between 12 months pre and 12 months post DIP was statistically significant ($p<0.0001$) with 209 out of 264 clients in the data having lower crime costs. This difference was still significant when homicide was taken out ($p<0.0001$).

Table 65. Difference in average crime costs for Wirral DIP clients, 12 months before and 12 months after DIP contact. Data for Wirral, April - September 2013.

	12 months before	**12 months after**	**Difference**
Average crime costs	£11,626	£2,717	£8,909
Average crime costs (excluding homicide)	£4,762	£2,728	£2,034

Table 66. Differences in crime volume and costs for Wirral DIP clients, 12 months before and 12 months after DIP contact, by drug tested positive for (crimes include homicide). Data for Wirral, April - September 2013.

Drug tested positive for	**Number of clients**	**12 months pre test**		**12 months post test**	
		Mean N offences	**Mean cost of offences**	**Mean N offences**	**Mean cost of offences**
Both (Cocaine & Opiates)	54	3.69	£39,207	2.76	£4,246
Cocaine	166	2.63	£4,808	1.02	£2,570
Opiates	46	2.80	£3,348	1.09	£1,334
Total	266	2.88	£11,538	1.38	£2,697

Table 67. Differences in crime costs for Wirral DIP clients, 12 months before and 12 months after DIP contact. Results of Wilcoxon signed ranks test (p <0.001). Data for Wirral, April - September 2013.

Difference pre-post DIP	**Number**
Higher costs	42
Same costs	13
Lower costs	209

A client level Monte Carlo simulation model was run for 10,000 simulated clients where each time a random scenario was drawn from the data distributions. Overall the Drug Interventions Programme came out as cost effective with an average net cost saving of £6,207, and 0.05 QALYs gained. A net benefit ratio was also calculated to compare with previous studies. The cost benefit ratio was £6.33 for every £1 spent, or £2.26 where homicide was excluded. As a comparison, in the DTORS study which included crime outcomes, also had a one year time horizon, but did not include the DIP, average net benefit ratio was around £2.50 for every £1 spent. Or in the earlier NTORS study which had a longer 4 year time horizon, the cost benefit ratio was estimated as £9.50 for every £1 spent (Godfrey et al., 2004). The QALYs gained from the DTORS study were quite small and subject to a lot of uncertainty so they did not have a big effect on the overall cost effectiveness. There is no evidence for the minimally clinically important difference in QALYs for drug treatment, although in a cancer study it was 0.11 QALYs, which is more than the average difference here (Walters and Brazier, 2005).

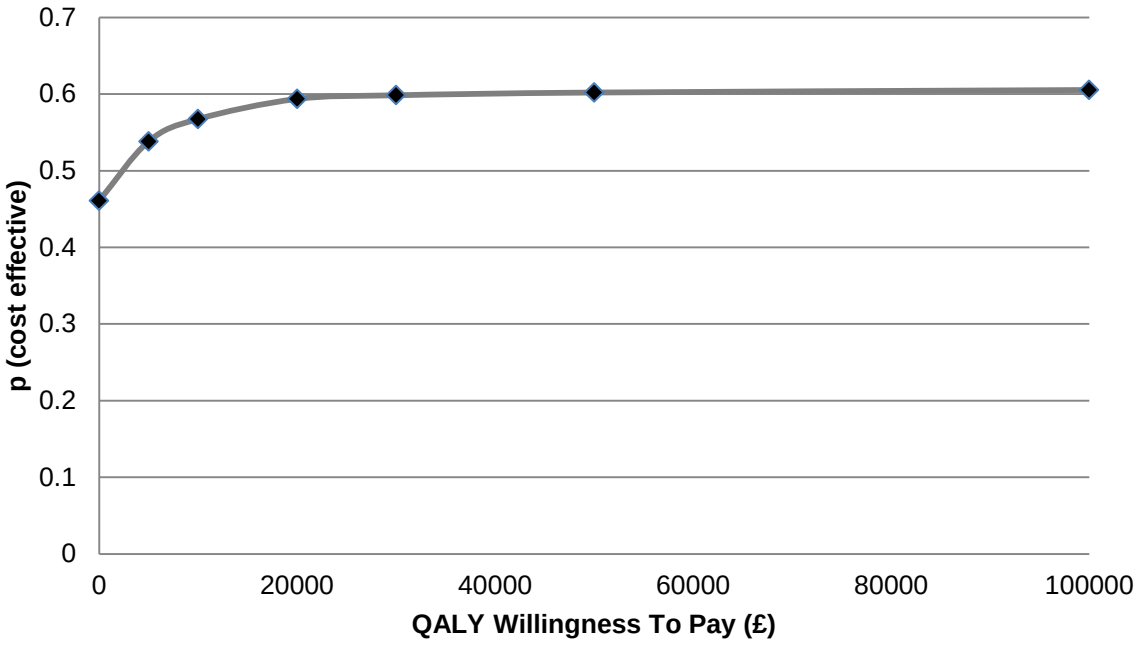
Table 68. Wirral DIP Economic modelling results. Shown with 95% prediction intervals.

Outcome	Average	2.5% lower limit	97.5% higher limit	Average with homicide taken out
Cost of crime - before	£10,226	£685	£37,069	£4,824
Cost of crime - after	£2,666	£0	£22,621	£2,802
Cost of DIP	£922	£532	£1,318	£923
Cost of drug treatment	£430	£236	£630	£431
QALYs gained	0.050	-0.34	0.44	0.052
Net costs	-£6,207	-£24,572	£18,042	-£668
Net Present Value (based on £20,000 per QALY)	£7,234	-£18,028	£27,237	£1,699
Total costs of DIP & drug treatment	£1,352	£768	£1,948	£1,354
Net social benefit (cost savings + monetary valuation of QALYs at £20,000 per QALY)	£8,560	-£6,115	£23,248	£3,062
Net Benefit Ratio (Benefits for every £1 spent)	£6.33	-£7.96	£11.93	£2.26

The cost effectiveness acceptability curve was developed to determine whether an intervention is likely to be cost effective at different levels of willingness to pay (WTP). This is particularly pertinent in drug treatment where QALYs related to crime are typically valued at £81,000 per QALY while QALYs related to health are typically valued at up to £30,000 per QALY.

Figure 71 shows the cost effectiveness acceptability curve (CEAC) for the DIP. The curve with homicide taken out was almost identical to this. At £20,000 and above, the probability of the intervention being cost effective stays at around 60%. This is because many of the QALY changes in the DTORS study were negative so as the willingness to pay for a QALY gets higher, the uncertainty around the cost savings have less of an impact on the cost effectiveness and the value of the QALY has the greatest impact. In other words, at a willingness to pay of £20,000 per QALY and above, the value of the positive individual QALY changes are close to balancing out the value of the negative QALY changes so it becomes more of a cost comparison than a cost utility analysis.

Figure 71. Cost Effectiveness Acceptability Curve. Wirral DIP model.



Drug Treatment Context-Mechanism-Outcome Table

As with the smoking and alcohol work, the CMO table was distilled from the results of semi structured interviews with practitioners, commissioners and staff within the services as well as looking at other evidence and policy documents (Table 69). There are multiple complex mechanisms surrounding drug use and treatment and they are still not always understood.

Table 69. Drug Treatment Context-Mechanism-Outcome Table. SC= source of information is local service commissioner, SM= source of information is service managers, SW = source of information is drug service caseworker.

Group	Contexts	Mechanisms	Outcomes
Heroin and crack users	Wirral has a history of heroin addiction which began in the late 1970s when people would abuse an opioid, Diconal which was widely prescribed and stolen. Heroin smoking took off in the early 1980s which coincided with an economic downturn. Soon many people were injecting heroin and turning to crime to fund their addiction. Since then, numbers have been stable as people have been in treatment and heroin is seen by the younger generation as socially unacceptable. Smoking of crack cocaine took off in the early 2000s but is also much less common than other drug use such as powder cocaine use. Many people who use crack also use heroin. Since the 1980s substitution, mainly with methadone, has been available as well as needle exchange and drug treatment (Parker et al., 1988)	Methadone maintenance gives people a chance to confront their psychological and social problems while not having to immediately confront their addiction to opiates by going 'cold turkey'. It can also help people to confront their financial problems. People are forced to confront their criminal behaviour and to recognise the impact they have had on their families and their communities. Psychosocial interventions allow people to explore and confront the causes of their drug use. Group sessions create a group dynamic which supports change (Connock et al., 2007). In Wirral, a large network of drug users means that drug takers can find a community of like-minded people to reinforce their drug taking behaviour (SW). Merseyside's prominence in the international drugs trade means drugs are cheaper and purer on Merseyside than other parts of the country and there are opportunities to work as middle men in the drugs business (SC)	Some people go into 'recovery' and become drug-free. Other people stay on methadone for a long time but it allows them to live more normal lives and have families, relationships and jobs. Some people leave treatment or relapse. Providing clean needles stops drug users from getting blood-borne viruses. Crime is reduced as people move to substitution or into recovery (SC).

Cocaine and stimulant users	Powder cocaine use has become very prevalent. Use of stimulants like ecstasy and amphetamine ('speed') is also prevalent although they are less addictive. Use of stimulant type novel psychiatric substances (NPS) in particular mephedrone is much higher than 5 years ago although has most likely peaked. Most stimulant users who use services are powder cocaine users but this may be partly as a result of how the service is structured (SM).	Powder cocaine addicts are made to reassess their behaviour through psychosocial interventions. They may be sparked to change through realising that cocaine use brings out impulsive or violent behaviour, that it has become too much of a financial drain or that it is affecting their health too much. Many cocaine users are in a chemical depression (SW).	People reduce their drug consumption or become abstinent. People understand what triggers cause them to use drugs (SW).
Cannabis users	Cannabis users often believe that cannabis is largely harmless. Cannabis is generally not a priority for police enforcement (SW).	Interventions offer people who get apprehended by police in possession of cannabis education sessions instead of receiving a police caution (SM).	These interventions often lead people to learn more about cannabis and the health risks associated with it and reduce their use (SM).
The general population	Many people in the general population have tried an illegal drug at some time, the most common being cannabis (Home Office, 2013).	People in the general population have differing ideas about the social acceptability of using different illegal drugs, with cannabis seen as acceptable by many and heroin seen as unacceptable by most (Home Office, 2013).	People's drug use is partly driven by what is socially acceptable (SC).
Image and performance enhancing drug (IPED) users	Many young people, mainly young men, are using IPEDs, mainly steroids. Steroid injecting is increasing (ACMD, 2011).	Services educate IPED users and provide needle and syringe exchange (SM).	IPED users get fewer injection site injuries and infections and reduce their risk of getting infectious diseases from sharing injecting works (SM).
Recovering drug users	Many recovering opiate users are drifting into alcohol dependency. Opiate users are sensitive to mu receptor activity in the brain and the pleasurable effects of alcohol. They also may not have other activities or social ties that make them less likely to drift into alcoholism (Gelemter et al., 1999).	Services try to keep channels of communication open through aftercare programmes and identify people at risk of drifting into alcohol dependence and warn people in recovery that this is a common occurrence (SC).	These interventions should increase the numbers of people in recovery who are supported to drink safely (SC).

Recovering drug users	Some recovering drug users want to return to the labour market.	In Wirral, structural unemployment means employers have a large pool of applicants, and do not need to keep people with drug or alcohol problems or take on people with a history.	People in recovery may struggle to get jobs outside of the drug and alcohol field.
Opiate users	Opiate users sometimes overdose, especially when they come out of prison or have not used for a period of time, or if a particularly pure batch of heroin is in circulation (SW).	Training users to administer Naloxone (an opioid antagonist) means that they can reverse the effects of a heroin overdose (McCauley et al., 2012).	Heroin overdose deaths should be reduced (McCauley et al., 2012).
Long term opiate users	Many long term opiate users are afraid of coming off methadone and there are many myths around what happens when an individual tries to become opiate free (SM).	Service users will do what they can to stay on methadone (SM).	Clients do not move into recovery and become drug-free (SM).
Drug treatment services	The services have met their previous targets but are struggling now to get enough people into recovery (SC).	The service still feels it is doing well given the circumstances that people are in (SM).	People in the service may feel like the commissioners are not appreciating what they do or their successes (SM).
Prescription drug users	Prescription drug abuse is increasing and the internet has made it easier to obtain these drugs without a prescription (Holmes, 2012).	Drug treatment services feel they are only seeing 'the tip of the iceberg' in terms of prescription drug users (SM).	Many prescription drug users do not get support from drug treatment, and deaths from some prescription drugs like Tramadol have increased greatly (SM; ACMD, 2013).

7.4.6 Discussion

This chapter has talked about an economic evaluation of drug treatment services in Wirral. The services that were modelled came out as being cost effective.

Parts of Wirral had a heroin ‘epidemic’ in the mid-1980s, with as many as 1 in 10 young people using in some areas, and a crime epidemic as individuals stole to fund their habit (Parker et al., 1988). This epidemic was related to high levels of unemployment and young people feeling disenfranchised, as well as relative naivety about the risks and addictive nature of heroin. There are lessons to learn about how communities need to be more resilient to economic shocks, and how public health messages around new drugs need to be

fed out into the community quickly. A peak in youth unemployment in 2011 does not seem to have led to an increase in young people trying crack or heroin as it did in the 1980s; this may be because the message has gotten out about the dangers of crack and heroin. Young people now are more likely to become daily cannabis users.

The picture now for Wirral is of an older treatment population of mainly opiate, or polydrug opiate and crack users who have been in treatment for more than 5 years and have a long drug taking career of 20 years or more. These individuals normally stay engaged with treatment for a long time and many have been on a methadone prescription for a long time. These clients are typically scared of coming off methadone and some have resigned themselves to being dependent on the drug for the rest of their lives. These individuals find it hard to leave treatment but when they do leave, many are likely to maintain their recovery although around 30% come back into treatment within six months. Most people who relapse into drug use do so in the first few days and weeks, so supporting people through this time would seem to be crucial.

There are also a group of people coming into treatment who are younger, do not use opiates, often come through being tested for drugs after being arrested, many of whom successfully complete treatment within 6 months. It has been reported that there are more professionals coming into services with cannabis and cocaine problems. The evaluation recommended that GPs and public health services should ask people more often about whether they use recreational drugs and offer brief interventions or harm reduction advice.

The data suggested that the previously observed increased people moving into recovery had stalled. Services did have written plans for each person on long term methadone setting out how they plan to move into recovery and the drug services had carried out segmentation exercises to identify people for intensive support. Wirral's lower performance compared with other areas could be due to a particularly 'sticky' population, or services not responding to a change of emphasis in the drug treatment system, or a combination of both.

It was reported that quite often people in Wirral who were previously heroin addicts are drifting into alcohol dependence, so it is important to address both at the same time. The evaluation recommended that if people are coming off methadone they need to be supported to drink safely; otherwise they would probably be better off staying on methadone than drinking alcohol excessively every day. Some drugs workers said that it can actually be more difficult to give up alcohol than other drugs in the long term as alcohol pervades British culture so most occasions and celebrations are marked with alcohol, and people like to test themselves by having a drink which often leads back into dependence. Service

commissioners talked about how, as more flexibility was introduced to the funding system, some of Wirral's drug treatment budget was spent on alcohol treatment. This was trying to recognise that recovery was just as relevant for alcohol, and that many people who initially have drug problems will also have or go onto develop alcohol problems.

Services mentioned that there was a limited resource for residential detoxification and rehabilitation. Both of these are quite expensive but it may be that a more efficient way of providing these services can be found. Many clients benefit from going out of area for their rehabilitation as they are further away from the people and the lifestyle that reinforces their drug use. Because drug clients are by their nature chaotic (one former client described themselves as a "juggernaut of self-destruction") it is hard to know how to target resource to get the most benefit; sometimes it is just about creating the right conditions for when "the penny drops" and someone is ready to change. Some drug service clients said how they learned something every time they relapsed so all of the cycles of relapse and recovery were not necessarily wasted; rather they indicated the natural cycles associated with drug use and recovery. Several people in drug services said it was very difficult to get drug treatment clients recognised as vulnerable adults by social services and this meant that drug treatment services were doing the job of social services.

Drug treatment service users reinforced issues over people being on high doses of methadone for a long time without any plan to get them drug-free; the need to sell clients the idea of recovery; the need for drug workers to be compassionate but also to push their clients to become drug-free; and that people in the recovery community could have a greater role in drug services. Some clients reported that they were stable on methadone and able to live productive, fulfilling lives and that pushing them into recovery could jeopardise their situation.

Clients discharged from the main drug treatment services provided by CWP showed significant improvements on self-reported psychological health and quality of life. Clients and other services indicated that the time that CWP drug services were able to spend with clients was not optimal and that some clients were on a long-term methadone prescription and most often were being followed up over the phone. It may be that services need to do more to focus on the interaction as well as the transaction with these clients.

The CWP Harm Reduction Unit include prescribing for common health problems and flu jabs and they argue that they act like a primary care service for some of the most marginalised people who may not access other services. The harm reduction service has spent a long time building up goodwill and trust with clients. The evaluation stated that these clients

needed to be considered when thinking about a future model for drug treatment as they might not access services if they were provided in community hubs.

Wirral has a lower prevalence of blood borne viruses like Hep B, Hep C and HIV than other areas (HPA, 2012), which is an indication of the success of needle & syringe exchange programmes, as well as prescribing and psychosocial treatment. These services are likely to be very cost effective, based on the results from other published evidence (e.g. Health Outcomes International, 2002).

Combating social isolation is really important in preventing drug use, and in helping prevent relapse in people who are in recovery who may have left their lifestyle and all of their friends behind, and may have moved from a different area. Promoting social inclusion and tackling stigma in communities is crucial (Weiss et al., 2014). There were issues highlighted around difficulties in finding housing for recovering drug addicts and for people coming out of prison. It was recommended that the council could endeavour to work more closely with hostels and housing associations to make sure all clients' needs were met.The data in this research found that the drug environment in Wirral was changing, with opiate and crack cocaine use decreasing, and other drug use being stable. Test on arrest data suggests that powder cocaine use has increased over the last ten years. National data suggests that drugs like ketamine, and novel psychoactive substances like mephedrone are increasing in use. The average age of first use for cannabis clients in ARCH was 14 which suggests that interventions aimed at reducing cannabis use need to be in place from a young age. Changing the culture around drugs and teaching young people that drug use is less common than they might think is also important.

Data from needle & syringe exchanges indicates that use of performance and image enhancing drugs like anabolic steroids, which are often injected, have also increased, which means that these people need access to advice and needle and syringe exchange programmes to prevent transmission of blood borne viruses and damage to blood vessels. These individuals are mainly young men, who often use other drugs and are at risk of spreading blood borne viruses through sharing needles, and having many sexual partners and infrequent condom use. These men often get their information and drugs from the internet and often use several different chemicals and use cocaine at weekends as well.

It is likely that prescription drug abuse is increasing, with prescription drugs being easier to obtain over the internet. GPs and other prescribers need to be very aware of the risk of drugs being diverted, particularly benzodiazepines, opiate analgesics like Tramadol, and Ritalin (Luty, 2014). The CWP drug service had one dedicated member of staff for

prescription drug dependence but they may only be seeing the tip of the iceberg, and it is believed that GPs would like a lot more help particularly for people addicted to benzodiazepine drugs like Valium.

In future if the opiate and crack using population continues to decline, there will be less need for the type of drug treatment services that there are now, and drug treatment services will have to realign more to provide brief interventions for less addictive drugs, and to treat powder cocaine as well as more novel drugs and prescription drug addictions. If the budget for drug treatment is reduced it needs to be reduced in a managed way to mitigate the chance of a blood borne virus or crime outbreak.

Drug treatment started on the principle of being accessible, accommodating and non-punitive, and being pragmatic in dealing with the presenting problem. If in the future, drug contacts are provided through council or healthcare hubs, or single points of assessment, this way of working needs to be preserved otherwise people may not access the services that they need.

Service providers reported that changes in funding to services for children and young people, and changes to benefits like the “bedroom tax”, paying benefits monthly, and increasing use of sanctions may have a negative impact on the most deprived communities and increase the risk of drug problems and make life harder for people who are already drug users. There is a danger that as heroin and crack addicts become less visible and the narrative around them disappears from the popular discourse, the stigma and fear associated with these drugs will diminish, and young people will be more likely to try them again. So reinforcing the message around the dangers of all drugs is important.

Using a welfarist perspective, it may be argued that drug users put a lower premium on health because they take risks with their health through their drug taking behaviour. However in our evaluations we have found that the increases in self-reported quality of life, and physical and psychological health, are much greater in magnitude than those reported from other studies where QALYs were used, which would typically be taking an extra-welfarist perspective. This may indicate that actually the differences in health related quality of life are more noticeable to drug users. However because the self-reported quality of life and health questions are asked to drug users as part of their meetings with case workers which involve a frank discussion of their recent drug use, there is some potential that they are primed to relate their drug use with health and thus give scores that relate more to their drug use, than say if they were asked after they had been to the gym. There is also the chance that they

would report bigger improvements to please their key worker because of a perceived risk of losing their methadone prescription or of other sanctions.

The DIP (Drug Interventions Programme) is a programme which deals with drug use relating to offending, including prison engagement and 'test on arrest' where people arrested for trigger crimes are tested for drugs and put into drug treatment. Data from LJMU and Merseyside Police was modelled. In Wirral crime costs were 77% lower in the 12 months post DIP than in 12 months before the DIP with an average difference of around £9,000 per client. An economic model suggested that the service was likely to be cost effective in Wirral. Although violent crimes are not considered 'trigger crimes' in the DIP, people can be drug tested on an Inspector's authority, and anecdotally, there has been an increase in people arrested for violent crime who test positive for cocaine.

Wirral is an area that has had a history of drug problems and still has quite a large drug using population (Hay et al., 2010). This combined with its long history of drug treatment services may mean that services in Wirral are more cost effective and more efficient than similar services in other areas which may be smaller and have a greater ratio of fixed costs to variable costs. The DIP evaluation should still be useful however in informing national and international decision making around drug test on arrest schemes. Because this kind of richness of crime data is not available for other drug and alcohol treatment services, the present study cannot make a direct comparison with other services in terms of their cost effectiveness through preventing crime.

The DIP evaluation cohort included people tested for opiates, cocaine or both. There are other commonly used Class A drugs that are not tested for in the DIP such as LSD, psilocybin mushrooms and MDMA (ecstasy). Opiates would include prescription drugs like Tramadol and codeine as well as street heroin and methadone.

The DIP testing process does not differentiate between powder cocaine and crack cocaine. It may be that some powder cocaine clients are more likely to be recreational or weekend drug users whereas crack cocaine clients are more likely to be addicts and to commit acquisitive crime to fund their addiction. Because crack is inhaled it produces a more intense high, which means that the dopamine system is typically down regulated more quickly than in powder cocaine use, leading to greater addiction (de Wit & Stewart, 1981). In clients who tested positive for cocaine, 46% had only one crime in the 12 months pre-test and of these, 79% of these had no crimes in the 12 months post-test which may indicate people being picked up for drugs possession may not have been arrested again in the future regardless of DIP contact. However within people spoken to in drug services it was felt that both powder

cocaine and crack cocaine clients benefitted from drug treatment, and crime was reduced in all groups. People working within drug treatment reported that powder cocaine users that they encountered had financial and health problems and that many were in a chemical depression from their continued drug use. This chimes with examples of financial problems (Boys et al., 2000), health problems (Murphy et al., 1989) and depression (Griffin et al., 1989) reported in the published literature.

In general cost-utility studies use an 'extra-welfarist' school of economics where utility is valued equally between individuals, rather than a 'welfarist' school where an attempt is made to value the individual welfare someone gets from an improvement in health-related quality of life (Brouwer et al., 2008). The QALY estimates used were from the DTORS, which may not accurately reflect the reality of the quality of life benefits for clients who have been through the DIP. The QALY estimates used the SF-12 survey instrument rather than the EQ-5D which is considered by NICE to be the gold standard. The change in TOPS data over time suggests that individuals who are identified through the DIP show a significant improvement in quality of life. The TOPs quality of life scores showed a 27% improvement between treatment start and treatment exit, which if translated into QALYs could make the DIP come out as much more cost effective. However unlike other quality of life questionnaires like the EQ-5D, Short Form 12 and Health Utility Index there is currently no standard method for converting the TOPs scores into QALYs. Because the health and quality of life questions on the TOPs follow other questions which relate to drug use and crime, there may be an effect of clients wanting to please their key worker by giving them positive answers to the questions on the TOPs. This analysis only had a one year time horizon so the actual cost savings and benefits may be much greater. Because the DIP is essentially a way of funnelling people away from crime into drug treatment there is not a set amount of the benefits that can be attributed to the DIP alone, as it is part of an integrated system of criminal justice, and drug and alcohol treatment.

The data used in this study were before and after data so there may be issues around regression to the mean. The DTORS cost effectiveness study was also a before and after study, which may underestimate the QALY gains from drug treatment, as without drug treatment individual quality of life may have declined rather than been stable, and a higher proportion of individuals may have died as well. It may not be considered ethical or practical to run randomised controlled trials in drug treatment but there may be scope for more robust research designs like cluster randomised controlled trials or natural trials in future. It would be interesting to compare the change in crime and drug treatment rates between areas that retain the DIP and areas that decommission it. However it is likely that the first areas to

decommission the DIP will be the areas that have the smallest problems around drugs and crime.

7.4.7 Conclusion

This evaluation was used as part of the recommissioning process; these services were about to be recommissioned when this piece of work was completed. Having a 'future proof' service with a focus more on the causes of drug use rather than on specific drugs was recognised as important, as this evaluation had stressed how fragmented the drug scene had become and that prescription drug use was also a growing problem. So for instance Table 56 shows a huge variety of different drugs being used by people in treatment; comparable historical data was not available but it is likely that drug use 20 years ago was a lot less diverse. Having more services targeted towards young people and more prevention was also recognised as important. Having services that gave people who had been on long term methadone an extra push towards recovery also featured in the process. There was talk about services being commissioned as generic addiction services, covering gambling addictions for instance, but this failed to materialise.

The results for the Drugs Intervention Programme were positive for Wirral; this was in contrast to some other areas in the North West of England which did not show the same magnitude of crime reduction in 12 months after being tested (Cuddy et al., 2015). Whether these results were due to how the service was implemented in Wirral, or due to differences in populations, we were not certain. In terms of the commissioning process this work was useful for commissioners and gave some ideas of what was working and what was not working. Because the narrative around drug addiction is so strong, and drug users in recovery become ‘evangelists’ for whatever method worked for them, it can be difficult to get a realist idea of which elements of a service were most successful in supporting to someone to become drug-free.

Chapter 8. Discussion

8.1 What this Thesis adds to the Canon of Knowledge

This chapter will discuss what this thesis adds to the existing body of knowledge, and make recommendations for policy and further research. The initial hypothesis was that economic evaluation when appropriately used potentially provides a useful tool by which to evaluate public health interventions and thereby to inform local decision making. The three case studies emphasize how the sensitive combining and application of economic evaluation techniques, equity impact analysis and realist evaluation can generate useful evidence to target public health resources more effectively. By combining detailed data and qualitative analysis with economic evaluation techniques it is possible to undertake a valid and reliable battery of techniques for evaluating the success of public health programmes. The case studies were undertaken in an action research setting in which they were directly fed into the public health decision making process within Wirral at a senior level. The feedback from decision makers emphasised the value that they placed on such evidence in terms of understanding the cost effectiveness of their services and identifying practical recommendations for how services can be improved. The modelling and the realist evaluation techniques used meant that the case studies had a lot of internal validity – the results were a good description of the local picture, but may have lower external validity – the results may be less applicable to other areas. But what is applicable to other areas is the techniques used, which means that with a few changes to the data, this type of evaluation could be replicated. The evaluation techniques in this thesis could be used in low income countries where public health interventions may have more potential to improve health and more years of life are lost through disease that is amenable to public health. In terms of treatment of addictions, there is definitely a need in low income countries. Tobacco smoking is becoming a much bigger cause of death in low income countries as tobacco companies have moved their efforts from Western countries where smoking rates are falling, to emerging markets which are less regulated in terms of tobacco control (Lee et al., 2012). Drug and alcohol use causes a high level of years of life lost in countries such as Namibia, Gabon and Mongolia compared to other countries (IMHE, 2015).

Implementation

In terms of implementation, measuring fidelity is important; if frontline service providers at the make changes to how services are implemented, the reasons and justification for such changes should be documented and made explicit. Effective service provision requires

providers to understand the processes of service implementation and provision and the links between inputs, processes and the outcome of service provision rather than being more 'ad hoc' in their approaches and judgments. In smoking and drug and alcohol treatment there exists considerable variation in success rates between different approaches and even within the same basic approach, and between individual case workers or advisors. In such a situation the effective dissemination and sharing of best practice and the implementation of effective mentoring becomes crucial. A lot of the success of these type of inter personal psychosocial interventions is down to using the right language and body language so learning this is crucial and for practitioners, having several different ways to explain something is essential.

One example of an intervention which provoked a debate around implementation was the ASSIST (A Stop Smoking in Schools Trial) which was implemented in several areas and was recommended as an approach by NICE. The ASSIST programme is a peer-based intervention which takes students aged 12-13 out of classrooms, starting with a minimum of 80 students for the first session and identifying approximately 18% as the most influential opinion leaders to continue and be trained as peer educators. Young people are more likely to smoke if their peers smoke; this is because of peer selection – selecting friends who smoke, and peer pressure – taking up similar behaviour to one's peers to fit in with the group. The intervention aims to change the social norms in the school community to be that of a non-smoking environment. ASSIST was based on the American 'Popular Opinion Leader (POL)' initiative for the promotion of sexual health in gay men. ASSIST was piloted in Wales and shown to be effective across different settings, although more effective in rural locations. ASSIST was shown to reduce uptake significantly by 25% after one year and by 15% after 2 years (although not statistically significantly after 2 years) (Campbell et al., 2008). An economic modelling study found that the programme was cost effective (Hollingworth et al., 2012).

After the pilot, ASSIST was developed as a set of products that local authority areas in the UK bought into. One such area was Wirral, where this service was implemented with some changes, made because of financial, planning and logistical issues, so while the original programme was delivered with young people aged 14 outside of school venues, the intervention in Wirral was delivered within schools. Now this may be regarded by the team who originally developed the interventions would as a case of omitting a crucial element of the programme, without which it may not have the same level of success, as a key component of the intervention was developing a rapport with young people and seeing the intervention as existing outside of discipline and control of the school system (Holliday et al.,

2009). So with this change in implementation, if the intervention was still successful or was more successful than the pilot, then it may be regarded as making a successful change or at least trimming out an element that was not crucial in the success of the intervention. However if the intervention was not successful it could be claimed that this lack of fidelity to the original intervention was the reason for a lack of success. This is what Hogwood & Gunn (1984) call the difference between 'non-implementation' and 'unsuccessful implementation'.

Policy making can be described as 'top down', incremental or 'bottom up'. Incremental policy means taking into account the situation as you find it rather than starting from zero and relying only on the evidence. Wirral was a pioneer for the harm reduction approach to heroin addiction so it was part of a 'bottom up' approach to policy. Also in Wirral there has been a history of a very small number of drug users being prescribed diamorphine (heroin) which may not be the case in other areas. This initially stemmed from patients transferred from one GP who was using a 'bottom up' or an experimental approach to implementation in terms of prescribing heroin and cocaine to drug users, while national policy said otherwise. But this was a GP with a special interest in treating drug addicts and perhaps a certain talent in it, or was at least welcomed because they were keeping drug addicts out of other GP's clinics. Any new service provider that takes over the service may have a blanket policy of not prescribing heroin, but they may be flexible and wish to understand the historical context that applies to these clients and may even make an exception. This is an example of a service being implemented differently to suit the context.

One of the aims in developing this thesis was to provide a set of techniques for how health economists, or analysts with modelling or research skills, should perform economic analyses of public health programmes. At a time of severe resource constraint in the provision of public health services the development of a body of cost effectiveness evidence based on rigorous and high quality economic evaluations will be essential in targeting interventions to areas of greatest health gain to local populations. Making the case for social gains from interventions debunks the libertarian argument that people should be left to make their own choices and the state should not step in. The external effects of alcohol, drug and tobacco use mean that everyone benefits from specialist interventions. The development of such an evidence base concerning how public health interventions work in the real world should also shed further light on factors underlying the significant variations that exist in outcomes for public health interventions. Such variations may result from differences in local population or other unavoidable characteristics; however they may also arise as a direct consequence of differences in the nature and quality of the implementation process and the quality, training and motivation of the staff involved in the implementation process. The methods in this

thesis mainly used an uncontrolled, before and after approach but these methods could be adapted to a control group approach which may produce more robust results.

Although many local area public health teams commission and carry out evaluations (including economic evaluations) very few of them are shared outside of their organisations. Given that the most important issues facing public health tend to be the same throughout the UK this 'silo' mentality appears to be inappropriate. Although lessons learnt from one locality may not be directly and immediately transferable to other localities the underlying lessons are likely to be generalisable to different locations. Such sharing of research results would greatly facilitate the development of true structures of evidence based policymaking within public health. The reasons for the current situation could partly be because organisations feel that their evaluations are commercially sensitive, or they are worried that the methods they have used were good enough for making the decision but may be criticised by others. There are many public health commissioners across the country with similar questions concerning the comparative clinical and cost effectiveness of the services that they support. However identifying methods by which the sharing of results becomes standard or even developing research partnerships by which public health bodies can develop consortiums to jointly identify, commission, fund and share in the results of research of interest to all providers or funders of public health initiatives would transform the quality and quantity of the evidence base on which to make these crucial prioritization decisions for the weakest members of our society.

8.2 Policy Recommendations

In order to effectively inform public health decision making evaluations must be of high quality, relevant to the decision in question and, above all, timely. Unfortunately evaluation and research is often undertaken to a different timeframe which makes it of limited practical relevance in informing public health policy and decision making. To be relevant, evaluation should become more aligned more with the policy cycle. More needs to be done to align the public health research, evidence, policy and commissioning landscape so that policies and interventions that have been proven to be clinically and cost effective are promoted. However, given that public health often straddles the border between health and social policy, these relationships between research, policy and knowledge transfer (turning evidence into practice) are complex and may suffer from poorly defined lines of responsibility and accountability.

The case studies in this thesis address areas of great importance to public health and are all priority areas for national policymakers. All of the services considered in the case studies in

this thesis are driven by national policies. The methods in this thesis may not be rigorous enough for the outcomes to influence policy directly, and the case studies may be seen as too parochial but there should be an opportunity for some of the deep qualitative insight to be used, or for the methods to be replicated. There are few studies that combine elements of realist evaluation with economic modelling. If public health interventions come out as very cost effective when compared to classical clinical interventions, and given that there is a large target population for them, these results could be used as evidence to call for a greater investment in public health. At the moment around 4% of the healthcare budget in the UK is spent on public health (PHE, 2015), when there is an argument for spending more on upstream interventions or changes in policy rather than treatment for diseases. Services for clients suffering from drug and alcohol addiction make up approximately 30% of national public health expenditure while policies and interventions aimed at enhancing smoking cessation make up another 5% (PHE, 2015). The high level of cost effectiveness arising from effective public health interventions aimed at smoking cessation implies that nationally more should be done to get smokers 'through the door' and into treatment. NICE's move to recommend harm reduction for smoking cessation for the first time means that local authorities could provide more interventions to help individuals to reduce their smoking rather than quit outright (NICE, 2013b).

Addiction services have all been evaluated to some extent, although the relative paucity of robust economic evaluations, particularly of drug and alcohol services, is perhaps surprising. The theory of people being robbed of their free will by addiction is one of the reasons the state justifies spending so much public money on treating addictions; these services are helping people who probably cannot help themselves (Vohs and Baumeister, 2009). But the main reason is that the cost of drug, alcohol and tobacco addiction on the health, social care and benefits system is huge, and the cost of drug and alcohol dependence on the criminal justice system are huge too (although in the case of alcohol, many people who are not dependent still use the health & criminal justice systems as a result of alcohol use as well). If services are very difficult to evaluate then this has implications for policy as well, as it raises the question of whether services should be commissioned if we cannot be certain that they work. As the policy space gets more crowded with an increasing number of policies, programmes and interventions, the number of interactions and the level of complexity in the system increases (Hogwood & Gunn, 1984). Policy can sometimes have unintended consequences where outcomes are different to those anticipated. For example the illicit drug economy is a complex system where an intervention to control supply of one drug may move people onto another more harmful drug. This is one reason why techniques such as realist evaluation are so valuable, because they take into account this complexity in systems.

This work also has implications for policy in demonstrating the success of these interventions that could be compared to other upstream policy interventions. The evidence is that, as you work down the chain from universal policy measures to individual level interventions, the risk of broadening rather than narrowing inequalities often increases (McGill et al., 2015). So even though we will see that the services looked at generally seem cost effective, they still have a large failure rate - people who do not recover from their addiction. Upstream interventions to reduce demand and access to alcohol, tobacco and drugs may be more successful and more cost effective. In the case of tobacco there have been several policy measures in recent years in the UK such as banning tobacco advertising, banning smoking in indoor public places, raising the minimum age to buy tobacco to 18, and plain tobacco packaging. It might be that in future bringing in measures like raising the age at which people can buy tobacco first to 21, then 25, then 30 years would be a cost effective addition to the current investment in stop smoking services. Or in the case of alcohol it might be that bringing in minimum alcohol pricing, displaying the calories prominently on alcohol bottles, and having mass education campaigns and making people in the alcohol industry pay towards alcohol-related injuries would be an addition to the current investment in alcohol treatment. It has been said that all policies can be boiled down to carrots, sticks and sermons; maybe the question is to find the most efficient mix of these three types of policies.

Because some of these addiction services have been around for a long time, it may be that they have become slightly tired and a shake-up is needed, or that all of the 'low hanging fruit' - the people who were ready to change and give up their addictions - have been through services, and they are left with inertia, with the 'refuseniks' who find it too hard to give up. Certainly with some of these services the trend over time is for the uptake rates or success rates to fall; for example in Niblett (2014), smoking cessation uptake had fallen for two years in England. The data in the alcohol chapter showed how a lot of alcohol detoxification clients represent to treatment within a short time, or in the case of opiate addiction there are many people who have been on methadone substitution therapy for many years. Maybe the fact that they are still alive, no longer using street heroin and no longer committing crime is a success, but maybe the fact that they are still dependent on opiates is a failure. The policy around drug treatment has changed to a recovery model, but for clients who have been on methadone for a long time, and may have been promised that they could stay on methadone forever, it may be difficult for them to react to this policy change. Merely telling someone that they need to aim for recovery isn't going to suddenly change their behaviour, and some people have moved on to stable lives with jobs and families, so coming off methadone is just an issue that they do not want to contemplate.

There is a wide variation in practice between local public health teams in terms of how services are commissioned which implies that services can be tailored to the individualised needs of local populations. However such localised commissioning can also be inefficient in terms of the effort required to produce individual service specifications and the size of the population for which services are being commissioned. In this regard developing a greater culture for sharing information and the templates on which contracts are based would significantly reduce unnecessary duplication of effort and enhance the efficiency underlying the process.

Contracts for public health services often specify data requirements without having clarified in detail what the data is needed for. Information that is both timely and accurate is the life blood of the public health commissioning process and developing a clear and rational view of data requirements is essential. In this regard the development of a national information system that can be easily accessed by commissioners to evaluate services would provide invaluable evidence to support their decision making. A lot of time in this project was devoted to requesting, chasing up, checking and cleaning data to ensure its availability, consistency and reliability. Further significant effort was required to match up data between different information systems with many information systems being largely designed for customer relations or contract management rather than analysing activity and outcomes.

There has been several cost effectiveness models produced that have been mentioned or used in this thesis. Most of these demonstrate that investment in public health interventions is a good use of resources when compared with a given threshold, for example the NICE threshold of £20,000 - £30,000 per QALY gained (Rawlins et al., 2010). Commissioners and providers like to know that their services are cost effective; however having more benchmarking data would be useful in terms of understanding whether services are efficient when compared with each other or with similar services in other parts of the country. Some tools around drug treatment like the Cost Effectiveness Tool and the Value for Money tool (PHE, 2013) allow comparison with national averages but not with local neighbours. There are always caveats around these types of comparison, in terms of comparative service costs and the extent to which differences in client characteristics make different services non-comparable.

8.3 Limitations of this Research

The nature of public health research is such that, almost inevitably, any comparisons made will be based on before and after data with no control group. Therefore it is not always possible to be sure that any change in behaviour or outcomes happened as a result of the

intervention and not as the result of external factors that will have altered between the two periods being analysed. These case studies have where possible looked at a pattern of outcomes rather just one outcome, and many have shown an improvement across several outcomes. Because many public health interventions involve moving people from behaving like a less healthy population to behaving like a more healthy population, there is usually a good quality theory for the mechanism of how an intervention improves health (Fischer et al., 2013). Using qualitative research and realist evaluation helps to understand and describe the mechanisms and give more evidence for how interventions work. With smoking cessation people have to exhibit a minimum level of motivation that is captured in their desire to access services. Requiring clients to display this level of motivation is crucial in effectively targeting services. For services to be most efficient they need to be accessed by people who are motivated to change their underlying health behaviours. If services are merely being used by either people who are not going to quit, or people who would have quit anyway, then they are not changing the health behaviour or improving the health experience of clients. It is identifying and assessing the extent of this alteration in knowledge, attitudes and behaviour that makes the isolation of effect underlying the provision of public health interventions so difficult to determine accurately.

It is difficult to compare results of studies with different perspectives and methodologies; this work has mainly taken a health and social care perspective. Having better data linkage between systems - so having access to healthcare usage, crime data, benefits data and use of public health funded services - would allow a far more comprehensive analysis to be undertaken with regard to comparative cost effectiveness.

8.4 Recommendations for Future Research & Methods

The double blind randomised controlled trial is universally perceived as being the 'gold standard' method for evaluation the effectiveness of healthcare provision. There is a significant body of such evidence in support of the belief that smoking cessation works but there have been comparatively few randomised controlled trials of drug and alcohol interventions. With drug and alcohol interventions there is still a real tension between the 'medical' and the 'social' model and identifying the optimum mixture of psychosocial and pharmacological interventions required by each client is paramount to achieving a successful outcome. In this manner having more practical research to identify which elements of psychosocial and pharmacological treatment are most important and how they can combine together in a mutually supportive manner would be useful.

The ambition with this thesis was to work towards a practical set of techniques and recommendations that should underpin the economic evaluation of public health programmes. In this regard the following recommendations are proposed for evaluating public health programmes;

1. Specify good quality, raw data from providers (but not data that is not needed).

Without raw data it is difficult to model the effectiveness of services, and to carry out equity impact analysis to understand if the service is taken up by those who need it most, and who the service works best for.

2. Do not reinvent the wheel, there are lots of models & tools out there, use them.

There has been an increase over the last few years in tools that can be used by local areas to estimate the return on investment for different public health interventions such as the NSMC Tools (Lister & Merritt, 2013) or the NICE Tobacco Control Return on Investment tool (Meads, 2014). It would be useful if more academics who produce models of cost effectiveness could in future try to package up their models so that they can be used by commissioners, and if more tools could be produced to measure efficiency as well as cost effectiveness, such as by collecting data and benchmarking between areas.

3. Engage with stakeholders; find out what questions they want the work to answer. Take time to immerse yourself and understand how services work.

The ambition with these pieces of work was for them to be useful for commissioners so always had in mind what the decisions were that the work was supporting. Engaging with stakeholders is really important in understanding mechanisms, particularly any novel mechanisms that may be missing from the policy literature.

4. Look at the international, national and local policy context.

Knowing what the policy objectives are and the story of why services were commissioned is an important element of evaluation. Understanding how policy has changed over time and who the main stakeholders are is important, so for instance in tobacco control the tobacco industry has traditionally fought against policy measures whereas in the case of illegal drugs the industry does not have such a public presence. Most of the services evaluated in this thesis have their roots in a rational, often 'top-down' evidence-based medicine or evidence-based policy approach, albeit that in the case of drug treatment, Wirral was a pioneer of harm reduction measures like needle and syringe exchange. Understanding the policy

context is important in describing which elements of a service or an evaluation are transferable and which may be unique to a particular service in a particular place.

5. Consider how services are commissioned; could they be commissioned on a bigger footprint? Do they need commissioners to take more of a handle or are they being micro-managed too much? Are services being commissioned for outcomes?

How services are commissioned is a key driver in how successful they are; striking the right balance in terms of size of service, and how much input the commissioners and providers have is important. If services are too small they may not be efficient but if they are too big they may be unmanageable. If commissioners and providers do not have a good relationship then they might reach a stalemate where providers are waiting to be micromanaged and commissioners are waiting for services to bring new ideas to the table. This relates to the implementation question, how much should implementation follow a 'top-down' process and how much should it be 'bottom-up' process? If services play it safe too much they may not be sensitive enough to local needs, but if they change too much they may lose the crucial ingredients of a service that really make it work.

6. Look at any JSNA or other needs assessments for any unmet needs in the population; are services hitting the right people? Is the service targeted towards vulnerable groups? This is the Equity Impact Assessment element. Think about inequalities in terms of equity impact analysis and consider using distributional cost effectiveness analysis.

Public health services have a responsibility to improve the health of the population but also to provide what Marmot (2011) called proportionate universalism, that is to tackle health inequalities, so understanding whether services are taken up and are achieving outcomes in proportion with the level of need in the population is important. Distributional cost effectiveness analysis has potential especially in describing services where cost effectiveness may be lower in some marginalised groups but this is where needs are greatest, and the cost of engaging and maintaining contact with vulnerable groups may be higher.

7. Realist evaluation – think about the context-mechanism-outcome; if you do not know which contexts and mechanisms generate the best outcomes then it is hard to generalise from the results.

Public health interventions are more context dependent than other clinical interventions so ignoring the influence of context and local implementation would mean that part of the

picture was being missed. Realist evaluation is not the only method, and other methods such as cause and effect or driver diagrams, 'theories of change' or implementation science could be used, but carrying out evaluation without considering the complexities of service delivery would be falling short of the potential to generate real insight into how a service worked. Any evaluation needs to try to account for the context, even if it cannot always control for the context.

8. State your perspective – in terms of economics, politics etc. There is no such thing as being impartial in social research.

It can be argued that being explicit about where you are coming from as an evaluator is important, however some people disagree with this position and in this piece of work this was not really included. One of the principles of realist evaluation is being clear about your own perspective (Pawson, 2013).

9. Tailor the economic model to the question being answered.

Any modelling should be driven by the question being posed, not by fitting a model to the question. Some services lend themselves better to a long term Markov model while some fit a decision tree model better. In the case of addictions, services where people are in contact with services for a long time and have a pattern of many cycles of relapse and recovery may lend themselves better to Markov models. Of course there are always compromises where data is not available.

10. Think about social return on investment and wider social value. Most public health interventions have cross sector effects so should not be measured in terms of health outcomes alone.

Having a broader perspective beyond health is important when looking at public health interventions, so for instance cigarettes are associated with litter and fires; alcohol and drugs are associated with crime. Considering these outcomes is important in working towards a true assessment of the value of these interventions. Including cross sector outcomes is difficult but not impossible; and it is better to try to include them even if it is difficult to be very precise.

11. Many services will come out as cost effective when compared to a threshold or a do-nothing alternative but most will not be maximally efficient. Where possible use benchmarking data to compare efficiency with similar areas.

Many public health interventions are cost effective when compared to a ‘do nothing’ comparator. Understanding which elements are most cost effective is important and involves thinking about which mechanisms are most successful in producing outcomes, and using benchmarking data to compare with similar areas allows an understanding of whether a service is as efficient as it can be. For instance, smoking cessation is very cost effective, but if an area has a cost per quit that is twice the national average; there may be scope for it to be a lot more efficient.

8.5 Reflections on Research

8.5.1 Overall Reflections

Overall commissioners and service managers welcomed these case studies as representing a “deep dive” look at the clinical and cost effectiveness of their major services. All service providers and commissioners want their services to be as good as possible and welcome feedback. In undertaking an evaluation of any public health intervention it is vital to work closely with health professionals who understand the context in which services operate. However when speaking to service providers and service users it is important to be aware of the commitment that they will have in favour of the service being evaluated--they are not independent assessors and should not be treated as such. They are inherently biased in favour of their own services, and often the knowledge that an evaluation was taking place would make them worry about the future of their service and concerned to show the service in a good light. However the experience of this thesis is that as long as the evaluator is aware that service providers and users are likely to provide a 'rosy' picture from their specific perspective, then the information and insights you can get from them can be invaluable Without getting this context from services around outcomes and activities it is difficult to get towards the 'true' value underlying the provision of each service.

There exists a scepticism in certain parts of public health with regard to the appropriate role that health economics should play in the evaluation of public health interventions (Brouwer et al., 2007). There is a perception in some that health economics can only play a limited role in terms of assessing the clinical and cost effectiveness of public health interventions. One of the major lessons of this thesis concerns the inherent importance of health economics in evaluating and targeting public health interventions. Just as in the case of other therapeutic interventions public health must make its case to be trusted with our increasingly scarce healthcare resources. A major element underlying such a case is the need to prove that the

outcomes that they produce are greater than those that can be produced through the use of their resources applied in some alternative manner. Public health cannot be spared the rigours associated with the justification of resource allocation on the basis of opportunity cost.

One of the principles of health economics is that wherever possible the analyses should be undertaken from a societal perspective which includes all relevant costs and outcomes (Weatherly et al., 2009). This thesis has emphasised the extent to which public health interventions have cross-sector effects which require an assessment of indirect and broader outcomes such as crime and productivity. There was resistance from some staff concerning collecting more outcomes data; as part of this process of evaluation it became routine for a lot more services to collect EQ-5D and WEMWBS data (sadly not for the case studies in this thesis) and spent a lot of time meeting with staff to explain how to do this. Both of these measures are self-reported so should be relatively simple to collect but it was a case of explaining to staff why it was important that such data should be collected and making staff feel confident about collecting them.

Services need to have outcome measures that are useful, practical but are robust and reliable. In drug & alcohol services they use TOPs (Treatment Outcomes Profiles) as the main outcome measure. These were developed by the UK National Treatment Agency (NTA). This includes questions about quality of life. However many economic evaluations use cost per QALY as the main outcome measure. It would be very valuable if a study could be done either linking TOPs results with EQ-5D data to estimate the health related quality of life changes associated with TOPs states, and to produce a lookup or conversion table to match up TOPs with EQ-5D and QALYs. This would be contingent on there being a consistent relationship observed between TOPs and EQ-5D. Alternatively, substance misuse services could use the EQ-5D instead of the health and quality of life questions on the TOPs. It could be that the NTA have explored this already and the decision is driven by issues around licensing the EQ-5D. It may be reasonable to expect that drug clients may not always be honest on questions on the TOPs as they want to maintain any substitution therapy (e.g. methadone) they get access to, and feel they need to please their key worker by showing that they are making progress.

8.5.2 QALYs

Some senior managers said that they knew what QALYs were but in fact it was clear that they thought of them as life years without the quality of life element. They did not realise that QALYs were often gained through an improvement of quality of life rather than an increase

in life expectancy. Although QALYs are the gold standard recognised by NICE, there still seems to be some way to go in explaining QALYs to people outside of the research and health economics fields, despite them being quite easy to understand once they have been explained.

Some managers were concerned about saying that services were cost effective 'compared to a do-nothing alternative'. This is a standard phrase used in health economics where there is no comparator, which is often the case when we look at public health interventions. But managers were concerned because they thought that this meant that an intervention was only slightly better than doing nothing. So health economics as a discipline should think about how these phrases can be interpreted.

8.5.3 Modelling

The main reason that modelling was used in this work was to account for gaps in the outcomes data and to estimate long term outcomes based on short term surrogate outcomes. Senior management did not particularly want to get involved in the complexities involved in modelling. On reflection, the researcher may not have made enough attempts to engage commissioners in the modelling process but tried their best to explain the models and their limitations to them. In particular it stressed how better quality outcomes data and cost data would make models more accurate and reduce uncertainty.

There was often disagreement between senior managers on key issues and on interpreting the results of the work; this is probably healthy though and indicates that there are not a small number of people setting the narrative. Managers bring their own experience into their perspective so those with a criminal justice background may have a different perspective to those with a nursing background, to those with a medical background or a psychology background.

There was concern that commissioners might not be happy with the estimates of cost effectiveness from these evaluations which were generally more conservative than those published elsewhere. For instance the incremental cost per QALY in the smoking cost effectiveness model was higher than other models which found that services would be cost saving. The main driver of this was the long term quit rate - national studies have long term quit rates of 20-30% with dual NRT or with Champix (Fidler et al., 2011), but there is not a lot of evidence for this, and in Scotland where they record long term quit rates it is more like 6-8% (NHS Scotland, 2012).

Commissioners were interested in the difference between cost effectiveness and efficiency; all of the interventions included in this programme of evaluations came out as cost effective (although some elements of another set of services looked at around weight management did not come out as cost-effective). But being cost effective compared to a do nothing alternative is not the same as being maximally efficient. Even if a service is cost saving, there may still be an opportunity cost when compared to another service that may produce a larger cost saving. Commissioners need to be getting the best value for money, not just delivering value at less than the threshold of £20,000 per QALY. For drug treatment services there was a broad range of benchmarking tools that allowed cost per client and cost per completion to be compared against national. But commissioners are only able to get data for their own area, not for their neighbours to compare against. Having more benchmarking data for public health services would enable better comparisons of efficiency to be made. For smoking cessation services there is a national data collection programme which enables cost per quitter to be benchmarked by local authority, although there are some doubts about consistency in the data collection.

Since public health split from mainly being one team to having separate commissioners and providers, there are probably expectations from providers who want the economic evaluations to demonstrate that services are cost effective, to commissioners who may want to demonstrate services are cost effective to show that they have been commissioning them well, or may want to demonstrate that they are not as cost effective as they could be and use this as reason to decommission or to put services out to tender, or at least to ask services to do more within their budget. From the outset these evaluations attempted to maintain an impartial perspective.

8.5.4 Realist Evaluation

This thesis has shown signs of how realist evaluation and health economics can complement each other well. Most of the researcher's work has been evaluating and prioritising public health interventions and realist evaluation is especially useful for accounting for the complexity (as well as cross sector effects, long payback time) and differences in implementation observed with public health interventions Other qualitative methods like logic modelling or 'theories of change' also have a contribution to make, but they often assume a linear sequence of events between inputs and outputs and may miss some of the latent power relationships that may determine whether programmes really work.

In realist evaluation, programmes are said to be unique but programme theories are rarely unique and are said to often be transferable and crop up over and over again. If this is the

case, it would be good for there to be a list/repository/database somewhere for programme theories, but this is not the case at the moment. This would mean that evaluators would not be starting from scratch so often.

In terms of understanding CMO configurations, it is difficult to know when elements stop being the mechanism and start being the context, so for injecting drug users, the availability of methadone and needle exchange services was originally the intervention in the mid-1980s but it could be argued that it has become the context, and possibly reinforces some drug using behaviour rather than limits it. For example drug users talked about methadone being something that was expected, which they then topped up with other street drugs like crack and heroin.

When public health managers were briefed about realist evaluation, they were generally quite interested in it. Public health managers are increasingly thinking about an assets-based approach to health rather than a deficit based approach and realist evaluation fits in well with this because like the assets-based approach it values the importance of understanding the local context (Morgan & Ziglio, 2007).

Realist evaluation uses the researcher's experience and viewpoints; but there is an idea that if the researcher is too empowered and enjoying themselves too much then they cannot be producing good research. Some commentators think that good research should be painful or it is not proper research. Realist evaluation is traditionally a mixed methodology. Qualitative and quantitative methods have been associated with different epistemological viewpoints and different research paradigms over the years. Traditionally quantitative research methods aim to design out the personal influence of the researcher with methods such as randomisation or blinding whereas some qualitative researchers believe in acknowledging or even celebrating the psychological identity of the researcher and the personal history and viewpoints that they bring to a research topic in the form of 'positionality'. Some research of sub-cultures would be impossible without first achieving insider status. However some commentators have suggested that qualitative research should also aim to be impartial (Hammersley, 2000).

As well as thinking about realist evaluation techniques within the narrative of the evaluations, the realist evaluation has been summarised using context-mechanism-outcome configurations in the form of a table. In some cases this has listed some contexts independent of mechanisms, which may not be the orthodox way of doing it. This has tried to disaggregate the CMO configurations by who the agent is, for example, whether it is the client using the service, the general population, or the service itself. It may have been useful

to add in an estimate of the importance or the proportion of people affected by a CMO configuration, so for instance for methadone, estimate what proportion of clients are afraid of no longer being prescribed methadone. It may also be useful to have an estimate of certainty for each CMO configuration, as they are essentially early theories. Highlighting which CMO configurations are based on only a small number of testimonies or a small body of evidence would be useful.

8.6 Conclusions

Health economics is still in its infancy and hence any 'conclusion' with regard to its role is inevitably premature. This is particularly so with regard to the application of health economic methodologies and techniques to the complex and inherently 'messy' area of public health. This thesis has used three case studies to demonstrate how economic evaluation techniques can be combined with elements of realist evaluation and equity impact analysis to develop a structure of evaluation that can and has been applied in practice to evaluate a series of public health programmes at a local level. Public health programmes typically comprise of complex interventions embedded in complex systems in which external elements (peer pressure etc.) are likely to be at least as powerful as the public health policy being assessed. As such, and in the absence of a randomised controlled trial, caution has to be exercised in identifying and isolating the effect of the public health programme alone. Economic modelling techniques combined with realist evaluation techniques can mitigate this to a certain extent and provide a method by which longer term outcomes can be modelled from short term surrogate outcomes enabling the true cost effectiveness of interventions to be estimated more robustly. Because most public health interventions involve trying to ‘nudge’ less healthy populations towards behaving more like healthier populations, theory plays a big role in planning programmes. Given the importance of targeting services at clients who are in the greatest need, equity impact analysis provided a method by which this crucial element could be incorporated into the evaluation. This was undertaken by analysing the distribution of clients accessing public health programmes and comparing this to a distribution of need or deprivation in the local population. In this manner it proved possible to assess the extent to which each intervention was achieving their aim of not only providing effective health outcomes at an acceptable level of cost effectiveness but also of assessing the extent to which each intervention proved effective in impacting on health inequalities.

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Appendix 1. Poster presented at University poster day, 2014.

Cost Effectiveness of Public Health Interventions for Drug, Alcohol and Tobacco Addiction

WIRRAL

Brendan Collins
Research Fellow in Health Economics and PhD Candidate,
University of Liverpool/ Wirral Borough Council. brenc@liv.ac.uk

UNIVERSITY OF LIVERPOOL

Abstract

Introduction: Public Health Commissioners need tools and methods to understand how cost effective services are. Currently many local evaluations focus on qualitative research or performance data.
Objective: We modelled the cost effectiveness of smoking, drug & alcohol treatment services in Wirral, a borough which has marked health inequalities and a history of drug and alcohol problems.
Results: All services were found to be cost effective and many were found to produce a net cost saving to the public purse in the long term.
Conclusions: Our results informed the commissioning process. These economic evaluation techniques should be considered more often.

Introduction

In 2013 local funding for smoking cessation, & drug & alcohol treatment in England moved from the NHS to local authorities. This is ring fenced until 2015 then it will decrease in real terms. Public health commissioners face tough choices about which services to keep investing in. My project is looking at services in Wirral, a borough of 330,000 people in the North West of England. Wirral has some of the widest health and economic inequalities in England, with the South and West of the borough being relatively affluent and the North and East being deprived.

Public health interventions differ from classic clinical health interventions in several ways;

- Multi sector effects – i.e. spend on drug treatment reduces crime.
- Often act on reducing risk across a population rather than any one identifiable individual.
- Often evolve or are applied differently across populations, so can be hard to evaluate or compare like with like (lack of fidelity).
- Can have a long payback time – i.e. vaccinations.

Methods

We collected individual client level outcomes data for each of the services and modelled the long term outcomes using economic modelling techniques in MS Excel VBA and TreeAge software. Depending on the data available, a lifetime Markov or cohort or short term decision tree model was adopted. None of the interventions were trials, so the analyses were all based on a pragmatic before and after comparison.
We were looking in particular at the cost per Quality Adjusted Life Year (QALY) gained – a QALY is the equivalent of one year of perfect health. The health watchdog NICE recommend public health interventions where the cost per QALY is less than £20,000.

Results

All services were found to be cost effective and many were found to produce a net cost saving to the public purse in the long term.

Conclusion

This piece of work looked in detail at locally funded treatment for addictions, which are characterised by cycles of recovery and relapse. Even with conservative assumptions about the probability of long term success, these services came out as cost effective when compared to a reference cost per QALY of £20,000 as recommended by NICE. Although involving some complex techniques and a lot of time, these economic evaluation studies can be a template for other areas to follow in assessing the cost effectiveness of their commissioned programmes.

Service modelled	Model time horizon	Net cost	Average QALYs gained per person	Cost/ QALY
Smoking cessation	Lifetime	£231	0.0199	£11,598
Alcohol Identification and Brief Advice	Lifetime	-£26	0.0046	Cost saving
Alcohol Structured Treatment	1 year	£1,123	0.1300	£8,638
Alcohol Residential Detox	Lifetime	-£653	0.0900	Cost saving
Drug treatment (stimulant and cannabis users)	2 years	£364	0.1150	£3,165
Drug treatment (opiate and crack users)	Lifetime	-£120,771	2.6100	Cost saving
Drug Intervention Programme (Test on Arrest)	1 year	-£6,207	0.0500	Cost saving

Appendix 2. Semi Structured Interview Questions.

Questions for semi structured interview for specialist smoking cessation treatment.

If there are any questions you don't want to answer or don't feel confident answering then this is fine. Any answers will be reported in a general way, not attributed to you.

1. How / why did you get into working in smoking cessation services? What are your personal motivations now?
2. What do you think makes for an effective stop smoking advisor?
3. How do you think the focus of smoking cessation has changed over time?
4. What do you think smoking cessation services should be delivering, in the way of services and outcomes?
5. How well do you think services work together?
6. What do you think needs to happen to make services work better?
7. What do you think about different stop smoking aids like NRT and Champix?
8. What do you think about electronic cigarettes and their impact on smoking and on services?
9. What factors do you think predict success in smoking cessation clients?
10. What are the changes you have seen in the smoking population you have seen over the last 3-5 years?

Questions for semi structured interview for alcohol specialist treatment.

If there are any questions you don't want to answer or don't feel confident answering then this is fine. Any answers will be reported in a general way, not attributed to you.

1. How / why did you get into working in alcohol treatment services? What are your personal motivations now?
2. What do you think makes for an effective alcohol worker?
3. How do you think the focus of alcohol treatment has changed over time?
4. What do you think alcohol treatment should be delivering, in the way of services and outcomes?
5. How well do you think services work together?
6. What do you think needs to happen to make services work better?
7. Do you think alcohol culture has changed over time?

8. What do we need to do to tackle the alcohol problems we have?
9. What proportion of alcohol clients are current or ex drug users?
10. What do you think about the effectiveness of alcohol detox?
11. What do you think about the effectiveness of residential rehab for alcohol problems?

Questions for semi structured interview for drug treatment.

If there are any questions you don't want to answer or don't feel confident answering then this is fine. Any answers will be reported in a general way, not attributed to you.

1. How / why did you get into working in drug services? What are your personal motivations now?
2. What do you think makes for an effective drug/substance misuse worker? What is an effective substance misuse worker?
3. I might ask what they understand by the term "Recovery", what do they think "Recovery" means?
4. Asking about the move to add recovery to the agenda and what they think about the shift of focus from "harm Reduction" to Recovery. Is this a good change?
5. What do you think substance misuse services should be delivering, in the way of services and outcomes?
6. How well do you think services work together?
7. What do you think needs to happen to make services work better?
8. Do you think there is more of a role for people in recovery in helping services?
9. What do you think about the role of methadone?
10. What do you think about fellowship?
11. What factors do you think predict success in drug service clients?
12. What are the changes you have seen in the drug treatment population over the last 3-5 years?
13. Do you think there are serious unmet needs in the population for drug treatment?

Appendix 3. Brief Report; Using a Survey to Estimate Health Expectancy and Quality Adjusted Life Expectancy to Assess Inequalities in Health and Quality of Life.

Keywords: EQ-5D, QALYs, population surveys, health inequalities

Word count: 2,410

Table count: 2

Figure count: 2

Abstract

There has been a policy debate in the UK about moving beyond traditional measures of life expectancy and economic output to developing more meaningful ways of measuring national wellbeing. In this study EQ-5D data from a wellbeing survey was combined with actuarial life expectancy (LE) data to estimate healthy life expectancy (HLE) i.e. years of life lived in good health, and quality adjusted life expectancy (QALE); i.e. quality adjusted life years lived for Wirral, a borough in the North West of England. It was found that the gap between Wirral and the most deprived areas was 4.45 years for LE, 5.34 for QALE and 7.55 for HLE. The gap in QALE was 20% greater than the gap in LE, while the gap in HLE was 70% greater. The fact that the QALE value lies between the HLE value and the LE value suggests that QALE is a more sensitive indicator than HLE, as in this study QALE is derived from 243 possible EQ-5D profiles whereas HLE is based only on whether or not an individual rates their health as good, a binary variable. This study discusses how QALE could be useful indicator for measuring health inequalities in future, especially as cost utility and QALYs are seen as the gold standard used by NICE in the UK to measure outcomes for health interventions in England, and discusses how a monetary valuation of QALYs could be used to put a societal cost on health inequalities.

1 Introduction

In the UK there has been a recent policy debate about regarding wellbeing as an economic good, measured alongside established measures of income like GDP, and health, such as life expectancy (LE) (1). This change in focus chimes with the OECD's Istanbul Declaration (2) on improving wellbeing and considers the Easterlin paradox first described in 1974 (3) – that increasing income does not always increase happiness, and hedonic treadmill theory, that adverse life events do not change an individual's level of happiness as much as expected (4). The UK Office for National Statistics (ONS) has formulated wellbeing measures across ten domains; the economy, individual well-being, our relationships; where we live, health, natural environment, personal finance, what we do, governance, and education and skills (5).

The UK had increasing levels of income inequalities since the 1970s, with inequalities in health outcomes remaining despite targeted investment (6). The gap in health expectancy or healthy life expectancy (HLE) between areas is typically wider than the gap in LE, indicating that health inequalities are greater when morbidity and mortality are combined. In the EU-27 countries the largest LE gap between countries for males is 12.3 years (between Iceland and Lithuania) whereas the largest HLE gap is 50% greater at 18.4 years (between Sweden and Slovakia). For females the highest LE gap is 7.6 years whereas the highest HLE gap is 18.3 years (data for 2009 (7)). A study comparing QALE across countries found some interesting patterns with women in two countries (Spain and the Netherlands) having a smaller QALE gap than LE gap, meaning that Spanish women live longer with more health problems than Dutch women (8).

ONS have previously measured disability-free life expectancy (DFLE) as well as HLE at birth and at age 65, calculated by combining actuarial cohort LE data with survey data. Although EQ-5D is used in population health surveys such as the Health Survey for England, it has not been routinely used to assess quality adjusted life years (QALYs) experienced across a population. There is a disparity between the UK gold standard in measuring health outcomes (the EQ-5D and QALYs recommended by the National Institute for Health and Clinical Excellence (NICE)) and what is seen as the gold standard in measuring health status across the population (measures such as HLE recommended by ONS). Internationally, DALYs (disability adjusted life years) are used for the World Health Organisation (WHO)'s Global Burden of Disease (GBD) project which was recently updated (9).

The EQ-5D-3L (Euroqol 5-dimension-3 level) is a self-reported health related quality of life tool which consists of five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) each of which can take one of three levels of severity (no problems/some or moderate problems/extreme problems). EQ-5D profiles are matched to UK utility scores giving the desirability of a particular health state, measured between -0.594 (worst health state) and 1 (perfect health). In a randomised controlled trial (RCT), change in utility as a result of a health intervention is measured in the same person at baseline and at set time intervals, so that any change can be attributed to the intervention. This change in utility is used to calculate QALYs experienced. The EQ-5D being self-reported has an element of subjectivity where individuals may have similar health status but responses indicate different levels of health problems. In a RCT individual improvement in the EQ-5D is used to calculate the QALYs gained, so this accounts for some of the subjectivity, an improvement is always an improvement. But in a population level study such as this, each individual is completing the EQ-5D once; however with a large sample size (1,522 people in this study) some of these subjective differences would even out across the population. This element of subjectivity is also true for HLE which is widely used as a measure of health status. It has been claimed that the EQ-5D is not sensitive in measuring health problems such as fatigue, sensory impairment, or mental health problems, and if so then the impact of these conditions would be under-represented in QALE derived from EQ-5D survey data.

The aim of this study was to show that because QALE is based on the EQ-5D profile, which has 243 possible health states, QALE will be more robust as an indicator of population health than LE or HLE, which are both essentially based on binary variables, i.e. whether after a period of time an individual is still alive, and if they are, whether they rate their health as good.

2 Methods

Life expectancy (LE), healthy life expectancy (HLE), and quality adjusted life expectancy (QALE) were calculated for Wirral, a borough in the North West of England, with an estimated ONS population of 309,000 people in 2009. This area was chosen because Wirral has extremes of affluence and poverty, with the East side containing some of the most deprived areas in England and the West side being an affluent retirement destination. Data was combined from a wellbeing survey (10) that was commissioned for the North West of England (N=1522 for Wirral), and carried out in 2009, and

mortality and population data for 2005-07 (3 years pooled), which was the most recent data available when the results were analysed. The methods for collecting the survey are described in more detail elsewhere (11). Survey data was weighted by age, gender and deprivation so that the scores should represent a true average. The weighted EQ-5D index scores and health status scores were combined for males and females and grouped into six age bands, 16-17, 18-24, 25-39, 40-54, 55-64 and 65 and over. These utility scores used the UK EQ-5D value set produced by Euroqol using a representative sample (3,359 people) of the UK population using the time trade-off method (12). Because the wellbeing survey was only carried out on individuals aged 16 and over, a maximum utility score of 1 and a probability of reporting oneself as being healthy of 1 was assumed for ages under 16.

Cohort life expectancy was calculated using the Chiang II method (13) used by UK ONS. The utility and self-reported health data was combined with the life expectancy data using the method outlined by Sullivan in 1971 (14). This is where QALE is calculated as

$$\text{QALE} = \frac{\sum_a^z (Ua \times Pa)}{\sum P} \times LE$$

Where U=average utility in age group a, P=Population surviving in age group a, z= maximum age group, and LE = total cohort life expectancy (years).

To understand inequalities in health and quality of life, the analysis was carried out for the whole of Wirral, as well as for the areas of Wirral that fell into the 20% most deprived and 20% least deprived lower layer super output areas (LSOAs, a small area geography used by ONS, where each contains on average 1,500 people) nationally based on the Index of Multiple Deprivation (IMD) 2007, which is a widely used UK deprivation measure (15). Of the Wirral population at the time, 32% fell into the most deprived quintile, and 10% into the least deprived quintile.

3 Results

The differences in utility and LE were analysed for Wirral as a whole and for the most and least deprived quintiles. The characteristics of respondents from each group are shown in Table 1. The least deprived areas have a greater proportion of males answering the survey, are older on average,

and have a greater proportion of people in employment. The groups were similar for average mental wellbeing score as measured using the Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS). The sample size in the most deprived areas is much greater, because people in the most deprived quintile make up a greater proportion of the population in Wirral than those in the least deprived, and a booster sample in the most deprived areas was commissioned.

[Table 1. Comparative statistics for the most & least deprived areas and the whole of Wirral.]

With an independent samples t-test, there was a significant difference in EQ-5D derived utility scores between deprivation quintile 5 (most deprived) (mean=0.749, sd= 0.343) and deprivation quintiles 1-4 (the rest of Wirral) (mean =0.809, sd=0.286); ($t(1522)=-3.710$, $p<0.001$). This result means that the most deprived areas experienced significantly lower utility on average than the rest of Wirral.

Weighted utility scores were lower for the most deprived areas than for Wirral and for the least deprived areas for all age groups except 18-24. The differences were most pronounced in the 40-54 and 55-64 age groups, with a 25% gap between most and least deprived (see Figure 1). The utility scores were from a population sample, not a cohort, so the smaller difference in older age groups could be due to a healthy survivor effect where individuals with the worst health have died at a younger age.

[Figure 1. Average EQ-5D index utility score by age group, whole of Wirral, Wirral most deprived, and Wirral least deprived.]

In terms of LE, the gap between the least and most deprived areas in Wirral was 8.1 years, while the QALE gap was greater at 12.7 years, and the gap in HLE was greatest at 14.7 years (see Table 1 and Figure 2). Between Wirral and the most deprived areas, the gap was 4.45 years for LE, 5.34 for QALE and 7.55 for HLE. The gap in QALE was 20% greater than the gap in LE, while the gap in HLE was 70% greater.

[Table 2. Life expectancy, healthy life expectancy and quality adjusted life expectancy in Wirral, most and least deprived areas, based on mortality and population data for 2005-07.]

[Figure 2. Life expectancy, healthy life expectancy and quality adjusted life expectancy in Wirral, based on mortality and population data for 2005-07.]

4 Discussion

For Wirral, years lived in good health were 73.7 on average for 2005-07, an increase of 6.1 years since the Census in 2001 when HLE was 68.6 years, although it may be that there are methodological issues with the survey used, such as it under-representing people who live in nursing homes or hospitals who are likely to have poorer health and lower utility scores. The sample size of the survey was quite large (1,522 across Wirral), and was weighted for age, gender and deprivation, but there were two relatively affluent areas of Wirral, Heswall and Royden, under-represented in the survey data. Also the survey was only carried out on individuals aged 16 and over, so we have assumed a maximum utility score of 1 for ages under 16, which was the average for 16-17 year olds in the survey, however it is likely that very young children suffer from more illnesses than 16-17 year olds meaning lower utility.

This study shows that depending on which measure is used, health inequalities can be shown to be much wider than the gap in LE alone. It may not be a surprise that the QALE gap is wider than the LE gap, as people who are healthy will generally live longer, but being able to quantify the gap over time will give an idea of how the gap has changed, and there are examples (such as comparing women in Spain and the Netherlands) where the LE gap is wider than the QALE gap, which is useful for stimulating discussion around trade-offs between health and longevity.

This study has shown how individuals living just a few kilometres away from each other in Wirral are experiencing health and illness differently; and Wirral has been said to be almost a microcosm of England in terms of having wide health inequalities. The fact that the QALE value lies between the LE value and the HLE value can be regarded as good evidence that it may be closer to the true picture of health expectancy. Whereas health expectancy is based on a binary variable, the EQ-5D-3L has 243 different health states.

Because EQ-5D derived utility scores can be less than zero, this could pose a mathematical problem in using QALE as a population health indicator, as people with utility scores less than zero would have

negative QALE, and would in effect have their life expectancy deducted from the population life expectancy. We used average utility scores in each age group, but scores below zero will have contributed to these averages. Some other studies have adjusted utility values so they are floored at zero (16). This ability of EQ-5D indices to be less than zero may be one of the reasons it is not routinely used to measure health-adjusted life expectancy across a population, as this may be ethically or methodologically controversial.

A study by Burström and colleagues (17) put a monetary value on the QALY gains that occurred over a period of time in Sweden, using a value of $100,000 per QALY. Monetary values are not typically attributed to health inequalities in this way in UK policy literature. The quoted NICE threshold for paying for new technologies is an incremental cost effectiveness ratio (ICER) of £30,000 per QALY gained. From the QALE data it can be calculated how many QALYs would be needed to raise the QALE in the most deprived areas to that of the whole of Wirral; this is 2053.9 QALYs per year. It can therefore be said that at this threshold of £30,000 per QALY, that the QALE gap in Wirral is worth £61.6million per year, or £620 per person in the most deprived quintile. This lost potential for quality and quantity of life could be considered as a premium that society pays for allowing such social inequities that manifest themselves in health behaviours and outcomes from before birth. This is only taking into account the threshold for investment to reduce health inequalities alone, as other forms of spending, such as on parks, policing or social care, do not have a similar decision rule, but would be closely bound to health inequalities and wellbeing.

Limitations of this analysis are that the wellbeing survey was for a slightly different time period than the mortality and population data was for, 2009 against 2005-07. The data we used was for all persons combined; the reason for not splitting by gender was because otherwise the numbers for individual deprivation quintiles and age groups would be too low to produce significant results. If males and females were analysed separately then males would have a lower LE and a wider gap between the most and least deprived, as the Slope Index of Inequality data for Wirral indicates (18). To calculate QALYs experienced we used the population in each age group and the average utility, we did not attempt to turn the utility scores into a continuous curve, so this may affect the QALE calculation in particular in the 65+ age group which is open-ended.

In conclusion, this article has outlined a method of combining health-related quality of life data (in this case using the EQ-5D) with life expectancy data to illuminate the socioeconomic gradient in quality-adjusted life expectancy. We have shown that in Wirral, average utility in the most deprived areas was significantly lower than in the rest of Wirral, and the gap in QALE was greater than the LE gap, and less than the HLE gap. This indicator of health inequalities could be used in future for testing the impact of health interventions on QALYs experienced across a population.

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Appendix 4. Smoking Treatment Data Definitions

Category	Data Item	Description
Basic Data	ID	Unique ID for each client
Basic Data	Attempt No.	Quit attempt number
Basic Data	Location	Local authority (always Wirral for Wirral data)
PersonalDetail	Gender	Gender (male or female)
PersonalDetail	Age	Age in years
PersonalDetail	Postcode	Partial postcode in format CH43
PersonalDetail	Electoral Ward	electoral ward
PersonalDetail	Ethnicity	ethnicity (standard ONS groups)
PersonalDetail	Socio economic classification	Full Time Student ; Home Carers (unpaid) ; Intermediate Occupation ; Managerial and Professional Occupations ; Never Worked or Unemployed For Over 1 Year ; Retired ; Routine and Manual Occupation ; Sick/Disabled and Unable To Return To Work ; Unable to code .
PersonalDetail	Fagerstromscore	Fagerstrom nicotine dependence test score (measured between 0 and 10).
Health	Medical Conditions	List of medical conditions e.g. high blood pressure, mental health problems, diabetes etc.
DetailofQuit	Type of Referral	Person who referred client, e.g. self, midwife, GP etc.
DetailofQuit	Attempt/Quit Date	Date of quit attempt in format 01/05/2011
DetailofQuit	4 Week Quit	Whether client has quit at 4 weeks and whether confirmed with carbon monoxide
DetailofQuit	12 Week Quit	Whether client has quit at 12 weeks and whether confirmed with carbon monoxide
DetailofQuit	Type of Intervention Delivered	Type of intervention out of Closed Groups ; Drop In ; Family/Couples ; One To One ; Open Groups ; Telephone Support.
DetailofQuit	Type of Intervention Setting	Setting of smoking intervention out of; Community Setting ; General Practice Setting ; Hospital ; Other: Please State; Pharmacy ; Primary Care ; Stop Smoking Service ;

Appendix 5. Drug & Alcohol Treatment Data Definitions

Note: These data definitions come from the NDTMS (national drug treatment monitoring system) dataset that was current when these data were analysed for the evaluation.

SEX

5.1 Sex codes

The permissible settings are as follows:

Code	Text	Comments	Sort Order
0	Not known	Person gender at registration	0
M	Male	Person gender at registration	1
F	Female	Person gender at registration	2
Z	Not specified	Person gender at registration	3

ETHNIC

5.2 Ethnicity codes

The permissible settings are as follows:

Code	Text	Comments	Sort Order
A	White	White British	1
B	White	White Irish	2
C	White	Other white	3
D	Mixed	White and Black Caribbean	4
E	Mixed	White and Black African	5
F	Mixed	White and Asian	6
G	Mixed	Other mixed	7
H	Asian/Asian British	Indian	8
J	Asian/Asian British	Pakistani	9
K	Asian/Asian British	Bangladeshi	10
L	Asian/Asian British	Other Asian	11
M	Black/Black British	Caribbean	12
N	Black/Black British	African	13
P	Black/Black British	Other Black	14
R	Other Ethnic	Chinese	15
S	Other Ethnic	Other	90
Z	Not stated	Not stated	99

NATION – nationality

REFLD – date of referral

AGNCY- Agency code

CLIENT – client reference number

CLIENTID – client ID

EPISODID – episode of treatment ID

CONSENT

5.5 Consent for NDTMS

The permissible settings are as follows:

Code	Text	Comments	Sort Order
N	No person not consented		2
Y	Yes person has consented		1

PREVTR

5.6 Previously treated

The permissible settings are as follows:

Code	Text	Comments	Sort Order
N	No		1
Y	Yes		2

PC – postcode

ACCMNEED

5.8 Accommodation Need codes

Code	Text	Comments	Sort Code
1	NFA - urgent housing problem	Live on streets Use night hostels (night-by-night basis) Sleep on different friend's floor each night	1
2	Housing problem	Staying with friends/ family as a short term guest Night winter shelter Direct Access short stay hostel Short tem B&B or other hotel Squatting	2
3	No housing problem	Local Authority (LA)/Registered Social Landlord (RSL) rented Private rented Approved premises Supported housing/hostel Traveller Own property Settled with friends/family	3

PRNTSTAT

5.9 Parental status codes

The permissible values are as follows:

Code	Text	Comments	Sort Code
11	All the children live with client		1
12	Some of the children live with client		2
13	None of the children live with client		3
14	Not a parent		4
15	Client declined to answer		5

DAT - Drug Action Team (of residence based on postcode)

PCT – Primary Care Trust (of residence based on postcode)

LA – Local Authority (of residence based on postcode)

DRUG1, DRUG2, DRUG3

APPENDIX F - DRUG NAMES AND CODES

Group Code	Group	Drug Code	Drug
1	Heroin	1101	Heroin illicit
		1102	Diamorphine
		1120	Diamorphine Hydrochl Elixir
		1121	Diamorphine Hydrochl Amps
		1125	Diamorphine Hydrochl Reefers
2	Methadone	1105	Methadone unspecified
		1106	Methadone Mixture
		1107	Methadone linctus
		1108	Methadone Tablets
		1109	Methadone Amps
		1110	Methadone Suppositories
3	Other Opiates	1000	Opiates unspecified
		1103	Morphine Sulphate
		1104	Opium
		1111	Dihydrocodeine
		1112	Dextromoramide
		1113	Dipipanone
		1114	Pethidine
		1130	Morphine Sulphate Amps
		1151	Hydromorphone
		1152	Oxymorphone
		1153	Hydrocodone
		1154	Oxycodone
		1155	Levorphanol
		1156	Phenazocine
		1157	Piritramide
		1201	Codeine Tablets
		1202	Dextropropoxyphene
		1203	Pentazocine
		1204	Buprenorphine
		1205	Codeine unspecified
		1206	Opiate Compound Analgesics
		1251	Nalbuphine
		1252	Alphaprodine

Group Code	Group	Drug Code	Drug
		1253	Anileridine
		1254	Ethoheptazine
		1255	Fentanyl
		1256	Phenoperidine
		1257	Meptazinol
		1258	Papaveretum
		1259	Tramadol Hydrochloride
		1300	Opiate Containing Mixture
		1301	Codeine linctus
3	Other Opiates (cont)	1302	Gee's linctus
		1303	Collis-brown
		1304	Phensedyl
		1305	Dextromethorphan (Actifed dry coughs, etc)
		1310	Kaolin and Morphine
		1401	Other Opiates
4	Benzodiazepines	2200	Benzodiazepines Unspecified
		2201	Diazepam
		2202	Chlordiazepoxide
		2203	Nitrazepam
		2204	Lorazepam
		2251	Clobazam
		2252	Clorazepate
		2253	Ketazolam
		2254	Medazepam
		2255	Oxazepam
		2256	Flurazepam
		2257	Temazepam
		2258	Triazolam
		2259	Lormetazepam
		2260	Prazepam
		2261	Bromazepam
		2262	Flunitrazepam
		2263	Chlormezanone
		2264	Loprazolam
		2265	Alprazolam

Group Code	Group	Drug Code	Drug
		2266	Clonazepam
		2267	Midazolam
5	Amphetamines (excluding Ecstasy)	3100	Amphetamines Unspecified
		3101	Amphetamine Sulphate
		3102	Amphetamine (pharmaceutical)
		3103	Methamphetamine
		3104	Dexamphetamine (Dexadrine)
		3110	Dexamphetamine Linctus/syrup
		3111	Dexamphetamine Reefers
		3112	Methamphetamine amps
		3113	Methylone
		3114	Mephedrone
6	Cocaine (excluding Crack)	3200	Cocaine unspecified
		3202	Cocaine Hydrochloride
7	Crack	3201	Cocaine Freebase (crack)
8	Hallucinogens	4000	Hallucinogens Unspecified
		4001	Mescaline
		4002	Psilocybin
		4003	Lysergide (LSD)
		4004	Phencyclidine
		4005	Ketamine
		4006	Dimethyltriptamine
		4007	Bromodimethoxyphenethylamine
9	Ecstasy	3406	MDMA
		3407	Methylenedioxyamphetamine
10	Cannabis	5000	Cannabis unspecified
		5001	Cannabis Herbal
		5002	Cannabis resin
		5003	Cannabis Oil
		5004	Cannabis Herbal (Skunk)
11	Solvents	6000	Solvents unspecified
		6001	Glue
		6002	Gas (butane / propane)
		6003	Volatile Nitrate (such as Amyl Nitrate)
		6004	Acetone

Group Code	Group	Drug Code	Drug
		6005	Hydro-Fluorocarbons
		6006	Trichloroethylene
		6007	Aerosols
		6008	Nitrous oxide
		6009	Petrol
12	Barbiturates	2100	Barbiturates Unspecified
		2101	Amylobarbitone
		2102	Pentabarbitone
		2103	Quinalbarbitone
		2104	Phenobarbitone
		2151	Butobarbitone
		2152	Heptabarbitone
		2153	Cyclobarbitone
		2154	Hexobarbitone
		2155	Barbitone unbranded
		2156	Methylphenobarbitone
13	Major Tranquilisers	8200	Major Tranquillisers unspecified
		8201	Chlorpromazine (Largactyl)
14	Anti-depressants	8300	Anti-depressants
		8301	Fluoxetine
		8302	Amitriptyline
		8303	Dothiepin Hydrochloride
		8304	Lofepramine
		8305	Paroxetine
15	Alcohol	7000	Alcohol unspecified
		7001	Beer or Cider
		7002	Wines And Fortified wines
		7003	Spirits
		7004	Mixture of Alcohol
16	Other Drugs	2000	Sedatives Unspecified
		2300	Anti-histamines Unspecified
		2301	Hydroxyzine
		2302	Cyclizine
		2303	Promethazine
		2400	Non-barb/benzo Sedatives unsp
		2401	Methaqualone

Group Code	Group	Drug Code	Drug
		2402	Chlormethiazole
		2403	Meprobamate
16	Other Drugs (cont)	2404	Zopliclone
		2405	Zolpidem Tartrate
		2451	Propranolol
		2452	Chloral Derivatives
		2453	Glutethimide
		2454	Mephenesin
		2455	Methylpentylynol
		2456	Methylprylon
		2457	Oxyprenolol Hydrochloride
		2501	Other Sedatives
		3000	Stimulants Unspec
		3151	Drinamyl
		3300	Appetite Suppressant
		3301	Diethylproprion
		3302	Phenmetrazine
		3303	Fenfluoramine
		3304	Mazindol
		3305	Phentermine
		3400	Other Stimulants
		3401	Methylphenidate
		3402	Pemoline
		3403	Prolintane
		3404	Fencamfamin
		3405	Caffeine
		3408	Khat
		3409	Nicotine
		8000	Other Psychoactive Drugs Unsp
		8001	Procylidine Hydrochloride
		8002	GHB/GBL
		8100	Minor Analgesics
		8400	Anti-diarrhoea/ Anti-emetic
		8501	Naltrexone
		8502	Antabuse
		8503	Clonidine

Group Code	Group	Drug Code	Drug
		8504	Lofexidine
		8600	Steroids Unspecified
		8601	Nandrolone
		8602	Stanozolol
		8603	Testosterone & Esters
		8604	Tetracosactrin
		8700	Antipsychotic Unspecified
		8701	Depixol
		8702	Thioridazine
		8703	Trifluoperazine
		8704	Pregabalin
		8705	Gabapentin
		8706	Areca nut (betel, paan)
		8799	Drug – not otherwise specified
18	Prescription Drugs	9001	Diamorphine prescription
		9002	Methadone prescription
		9003	Buprenorphine prescription
		9004	Codeine prescription
		9005	Other prescribed drugs
19	Novel Psychoactive Substances	8800	NPS Other – predominantly stimulant
		8801	NPS Other – predominantly hallucinogenic
		8802	NPS Other – predominantly dissociative
		8803	NPS Other – predominantly sedative or opioid
		8804	NPS Other – predominantly cannabis
		8805	NPS Other – effects different to available classifications or not stated
99	Misuse free	9996	No Second Drug
		9997	No Third Drug
		~~9998~~	~~Alcohol Free~~
		~~9999~~	~~Drug Free~~

DRUG1AGE - age when first used drug 1

ROUTE

5.30 Route of administration of problem substance No 1 codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	Inject		1
2	Sniff		2
3	Smoke		3
4	Oral		4
5	Other		90

RFLS

5.31 Referral source codes

The list of numeric codes for the sources, which refer clients to Treatment Providers (i.e. agencies)

Adult services referral source codes

Code	Text	Comments	Sort Order
4	Self		1
3	GP		2

Code	Text	Comments	Sort Order
1	Drug service statutory		3
63	Arrest Referral		4
64	DIP		5
65	Criminal Justice Other		6
2	Drug service non-statutory		7
15	Other		8
8	Probation		9
6	DRR	Drug Rehabilitation Requirement – formally Drug Treatment and Testing Order (DTTO)	10
13	CARAT/Prison	Counselling, Assessment, Referral, Advice And Through-care.	11
11	Psychiatry services		12
19	Social Services		13
16	Education Service		14
12	Community care assessment		15
9	A&E	Accident and Emergency	16
14	Employment Service		17
10	Syringe Exchange		18
18	Connexions		19
17	PRU	Pupil Referral Unit and other alternative education provision (e.g. tuition provided for an excluded young person (home tuition/alternative education schemes etc)	20
20	CLA - Children Looked After		21
21	Sex Worker Project		22
22	Hospital	General Hospital	23

Code	Text	Comments	Sort Order
23	Psychological Services		24
24	Relative		25
25	Concerned other		26
32	Community Alcohol Team		27
36	Outreach		28
53	Job Centre Plus		29
56	Employer	Applicable to primary alcohol clients only	30
57	ATR	Alcohol Treatment Requirement (Applicable to primary alcohol clients only)	31
58	Peer	i.e. Other service user (Applicable to primary alcohol clients only)	32

TRIAGED – triage date

CPLANDT – care plan start date

INJSTAT

5.32 Injecting status codes

The list of numeric codes for 'Injecting Status'.

Code	Text	Comments	Sort Order
P	Previously injected (but not currently)		1
C	Currently injecting		2
N	Never injected		3
Z	Client declined to answer		4

CHILDWTH

5.11 Are any of your children/the children living with you

Code	Text	Comments	Sort Code
1	A child looked after or in foster care		1
2	Subject to a child protection plan		2
3	Both		3
4	Neither		4
98	Declined to Answer		5

PREGNANT

5.34 Pregnant codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
N	No		1
Y	Yes	Only expected for female clients	2

ALCDDAYS

Drinking days - Number of days in the 28 days prior to initial assessment that the client consumed alcohol

ALCUNITS

Typical number of units consumed on a drinking day in the 28 days prior to initial assessment

DUALDIAG

5.35 Dual diagnosis codes

The permissible values are as follows:

Note: Not applicable to YP

Code	Text	Comments	Sort Order
N	No		1
Y	Yes		2

HEPCSTAT

5.36 Hep C Intervention Status

The permissible values are as follows:

Code	Text	Comments	Sort Order
A	Offered and accepted		1
B	Offered and refused		2
D	Not offered		3
F	Assessed as not appropriate to offer		4
G	Offered and accepted (YP specific)	Not yet had a test (YP specific)	5
H	Offered and accepted (YP Specific)	Had a hep C test (YP specific)	6

HEPCTD HEPCTSTD

5.37 Hep C tested

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	No		1
2	Yes		2
99	Not asked		3

HEPBVAC

5.38 Hep B vaccination count codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	One vaccination		1
2	Two vaccinations		2
3	Three vaccinations		3
C	Course completed		5

HEPBSTAT

5.39 Hep B intervention status codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
A	Offered and accepted		1
B	Offered and refused		2
C	Immunised already		3
D	Not offered		4
E	Acquired Immunity		5
F	Assessed as not appropriate to offer		6
G	Offered and accepted (YP Specific)	Not yet had any vaccinations (YP Specific)	7
H	Offered and accepted (YP Specific)	Started having vaccinations (YP Specific)	8
I	Offered and accepted (YP Specific)	Completed vaccination course (YP Specific)	9

HLCASSDT

Drug treatment health care assessment date

TOPCC

5.40 TOP Care Coordination

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	Yes		1
2	No		2

DISD – discharge date

DISRSN

5.41 Discharge Codes

Code	Text	Comments	Sort Order
80	Treatment completed – drug-free		1
81	Treatment completed – alcohol-free	Applicable to Adults only	2
82	Treatment completed – occasional user (not opiates or crack)		3
83	Transferred – not in custody		4
84	Transferred – in custody		5
85	Incomplete – dropped out		6
86	Incomplete – treatment withdrawn by provider		7
87	Incomplete – retained in custody		8
88	Incomplete – treatment commencement declined by client		9
89	Incomplete – client died		10
93	Transferred – programme completed at the residential provider – additional residential treatment required	Applicable to residential and inpatient services only	11
94	Transferred – programme completed at the residential provider – additional community treatment required	Applicable to residential and inpatient services only	12
95	Transferred – programme not completed at the residential provider – additional residential treatment required	Applicable to residential and inpatient services only	13
96	Transferred – programme not completed at the residential provider – additional community treatment required	Applicable to residential and inpatient services only	14
97	Transferred – Transition to adult substance misuse service	Applicable to YP only	16

MODAL

5.43 Treatment modality codes

Adult drug treatment provider services

Code	Text	Comments	Structured	Sort Order
8	Needle Exchange		N	1
9	Outreach		N	2
10	Advice and information		N	2
93	LASARS Assessment	A LASAR modality should be opened when the LASAR carries out their assessment with the client and should remain open while the LASAR continues to be responsible for the client in the pilot. Other fields should be completed as per normal business definitions	N	4
94	Pharmacological Intervention		Y	5
95	Psychosocial Intervention		Y	6
96	Recovery Support		N	6

Adult alcohol treatment provider services

Code	Text	Comments	Structured	Sort Order
93	LASARS Assessment		N	1
94	Pharmacological Intervention		Y	2
95	Psychosocial		Y	3

	Intervention			
96	Recovery Support		N	4
76	ALC - Brief Intervention		N	5

REFMODDT – modality referral date

MODID – modality ID

FAOMODDT

Date of First Appointment Offered for Modality

MODST – modality start date

MODEND – modality end date

MODEXIT

5.95 Modality Exit Status codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
A	Mutually agreed planned exit		1
B	Clients unilateral unplanned exit	Also used when client has died	2
C	Intervention withdrawn		3

SUBMODDT – sub modality start date

TITDATE – time in treatment date

TITREAT

5.93 Time in Treatment

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	14 hours or less	Standard	1
2	More than 14 and less than 25 hours	High	2
3	25 or more hours	Very High	3

TITID – time in treatment ID

TOPDATE - TOPS date completed

TOPID – TOPS ID

TRSTAGE

5.97 TOP Treatment stage

The permissible values are as follows:

Code	Text	Comments	Sort Order
A	Treatment Start		1
B	Review		2
C	Treatment Exit		3
D	Post-Treatment Exit		4

ALCUSE OPIUSE CONSMP CRAUSE COCAUSE AMPHUSE CANNUSE OTDRGUSE

5.98 TOP Substance Use Questions and Permissible Responses:

TOP Substance Use Questions	Permissible Responses	Comments
Alcohol	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Opiates/opioids (illicit)	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered Includes street heroin and any non-prescribed opioid, such as methadone and buprenorphine
Consumption	0-200 Units or NA	Use NA only if information is not disclosed or not answered. Note NA value 9999 For CDS L and later
Crack	Between 0	Use NA only if information is not disclosed or not

	and 28 or NA	answered
Cocaine	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Amphetamines	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Cannabis	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Other Problem Substance?	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered

IVDRGUSE SHARING

5.99 TOP Injecting Risk Behaviour Questions and Permissible Responses:

TOP Injecting Risk Behaviour Questions	Permissible Responses	Comments
Injected	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Inject with needle or syringe used by someone else	Yes, No or NA	Use NA only if information is not disclosed or not answered
Injecting using a spoon, water or filter used by someone else.	Yes, No or NA	Use NA only if information is not disclosed or not answered

SHOTHEFT DRGSELL OTHTHEFT ASSAULT

Shop theft	Number of days in previous 28 days that client has been involved in shop theft
Drug selling	Number of days in previous 28 days that client has been involved in selling drugs
Other theft	Has client has been involved in theft from or of vehicle, property or been involved in fraud in last 28 days
Assault/violence	Has client committed assault/violence in last 28 days

PSYHSTAT PHSTAT QUALLIFE PWORK EDUCAT ACUTHPBM HRISK

5.100 TOP Health & Social Functioning Questions and Permissible Responses:

TOP Health & Social Functioning Questions	Permissible Responses	Comments
Clients rating of psychological health	Between 0 and 20 or NA	Use NA only if information is not disclosed or not answered
Days paid work	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Days attending college or school	Between 0 and 28 or NA	Use NA only if information is not disclosed or not answered
Clients rating of physical health	Between 0 and 20 or NA	Use NA only if information is not disclosed or not answered
Acute Housing Problem	Yes, No or NA	Use NA only if information is not disclosed or not answered

At risk of eviction	Yes, No or NA	Use NA only if information is not disclosed or not answered
Clients rating of overall quality of life	Between 0 and 20 or NA	Use NA only if information is not disclosed or not answered

EMPSTAT

		actively seeking work.	
12	Unemployed and seeking work	Expansion of Unemployed	6
13	Not receiving benefits	Expansion of Unemployed i.e. those who are not working or actively seeking work.	7
14	Unpaid voluntary work	Expansion of Unemployed i.e. those who are not working or actively seeking work.	8
15	Retired from paid work	Expansion of Unemployed i.e. those who are not working or actively seeking work.	9
99	Not Stated	Expansion of Unemployed i.e. Person asks but declines to answer	10
5	Other		90
6	Not Known		98

5.127 Employment status codes

The permissible values are as follows:

Code	Text	Comments	Sort Order
1	Regular Employment		1
2	Pupil/Student		2
9	Long term sick or disabled	Expansion of Economically Inactive i.e. those who are receiving incapacity benefits, income support, or both	3
10	Homemaker	Expansion of Economically Inactive i.e. those who are not working or	4

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